

## **NPOL Science Log**

NAMMA

08/15/2006-09/30/2006

Kawsara, Senegal

Fill in description of setup, testing, and calibration...

Location:

NAMMA\_NEAR\_S scanning strategy:

19 angles from 0.8 to 49.0 degrees: 0.8, 1.5, 3.2, 5.5, 7.9, 10.3, 12.7, 15.1, 17.6, 20.0, 22.6, 25.1, 27.8, 30.5, 33.2, 36.1, 39.1, 44.0, 49.0

NAMMA\_FAR\_S scanning strategy:

19 angles from 0.7 to 33.0 degrees: 0.7, 1.4, 1.8, 2.3, 3.4, 4.5, 5.7, 6.9, 8.2, 9.6, 11.3, 13.0, 15.0, 17.2, 19.8, 22.5, 26.5, 29.5, 33.0

(The following information is the same for both scanning strategies listed above)

Resolution: 1.4 degrees (azimuth)

Pulse Width: 0.80

Polarization: H + V

Data: T, Z, Vel, Width, SQI, ZDR, KDP, PhiDP, RhoHV

Samples: 128

Start Range: 0.00 km/Bin Spacing: 199.9 m

Max Range: 150.0 km

Unambiguous Range/Velocity: 157.8 km/25.4 m/s

High/Low PRF: 950 Hz

Temporal resolution is 15 min.

8/21/2006: First day of operations.

1415 UTC: Operations began. PAK

16:27 UTC: Low-level cloud streets to the SW. A system moved through to the south last night and formed into a vortex off shore and is currently near Ghana. We are able to see some of the convection associated with it to our SW over the Atlantic but are only able to see a small section of the full system. AER

16:52 UTC: Alternate scan strategy started. AER

16:59 UTC: There is a lot of ground clutter especially around Dakar which becomes even more evident for the Alternate scan strategy. There is missing data (looks like beam blockage) when Alternate switch hardware locks. AER

18:07 UTC: Convection building to the SE: 23-28 dBZ, 80 km range, just S of E. We have now resumed normal scan strategy (NAMMA\_FAR\_S) AER

18:33 UTC: We spent most of the day testing and optimizing the scanning strategy. (Although we originally wanted to have 10 minute volume scans, in order to have better spatial resolution we have decided to use 15 minute volume scans. AER) No significant weather has been observed since operations began. I sent in the Daily Summary to the project office. PAK

8/22/2006:

0600 UTC: Uneventful night shift. NPOL worked properly and there is no weather in the area. Clear skies gave a view of some stars tonight. The only thing to report is that Dakar shows up quite nicely and the classic NPOL side lobe ring is evident at that range and a few ranges inside that one as well. Not sure what targets are creating the other rings. There was some AP tonight as well. *AJN*

0815 UTC: Stopping scans to check our polarization. Lester placed a feedhorn and siggen down the road to the north. I have pictures. PAK

0929 UTC: Streets of popcorn convection with thick cirrus overhead. AER

0930 UTC: Feedhorn test was successful. We are transmitting in the correct polarizations. Up and running with Surveillance and NAMMA\_FAR. PAK

1200 UTC: Students and scientists from the Lab visited. A tour was give of the flux site and radar site. No Significant weather at this time. PAK.

1530 UTC: Less cirrus, more popcorn convection (shallow). AER

2300 UTC: Another severe clear night. NPOL working properly. *AJN*

8/23/2006:

0200 UTC: Severe clear. Many bugs are working their way into the science container somehow. *AJN*

0430 UTC: Noticed that NPOL was not radiating but still scanning. By looking at the products, it seems to have stopped radiating at the 0400 UTC scans. Stopped the scans, re-started a surveillance scan and it began to radiate again. Re-start of NAMMA\_Far-S and surveillance cycle seems to be working properly. We will monitor. *AJN*

0530 UTC: Everything seems to be running normally again. I will notify Lester and Paul of the hiccup when they get here in the morning. *AJN*

0700 UTC: The day crew relieved the night crew. No significant weather in the region. We are expecting another clear day. PAK

0727 UTC: Streets of shallow convection with thick cirrus overhead. (Some clouds have a brownish color likely from dust acting as CCN. This is something that is not uncommon to see in this region.) AER

1000 UTC: I have noticed that the side lobes from Dakar on the radar display are a little less today, otherwise clear. Outside more shallow convection for the most part although a few show some building. AER

1120 UTC: Put tape on the gaps around the door of the science container which will hopefully reduce the bug issue being experienced by the night crew. Scattered Cu field overhead currently with cirrus deck filtering the sunlight over the remaining area. No other significant weather in the area and radar is currently scanning clear on both the surveillance scan and NAMMA\_FAR. CSF

1200 UTC: Fewer clouds outside although it feels warmer (31.6° C according to measurements at 1.5 m AGL from flux tower). AER

1215 UTC: Conditions remain nearly the same as last hour though the wind has begun to become a little gusty with peak of 23 mph and sustained of around 15 mph from the southwest (~230°) per the anemometer mounted on the science container. Maintaining severe clear throughout the volume and surveillance scans. CSF

1302 UTC: Even fewer clouds overhead than last hourly observation. Still clear on the radar display. Everette notified us that the SAL will be building and then followed by a trough within the next 48 hours – more on this later. AER

1457 UTC: Two distinct clouds streets composed of very shallow clouds with a thin cirrus deck above. Radar display remains clear. AER

1556 UTC: Two distinct cloud streets remain – Chris suggested that it may be some kind of weak land/sea convergence as one of the lines follows the coast of Senegal. Skies are also clearing to the E. Radar remains clear. AER

1500-1645 UTC: NPOL was down for software upgrades 8.08 -> 8.10.2 to NPOL 1. However, that didn't work so well. Lester and I returned to an older version 8.07 to get it working again. I believe we know the fix, but will try later. PAK

1635 UTC: Gusty wind continues to blow from the west-southwest as a few more low level clouds are now racing eastward in an onshore flow situation.

Everette reported 40kt winds above 800 hPa from the sonde launched earlier today and it appears this might be mixing down to the surface as the afternoon goes on. Max wind now up to 27 mph but near constant between 15-20 mph. Land-sea convergence cloudiness is persisting but does appear to be breaking up slightly. Radar has been down for roughly the last hour and a half while Paul Kucera and Lester Atkinson were attempting to install a new version of IRIS on NPOL1. Bringing back up on surveillance and NAMMA\_FAR scans at 1645 UTC. CSF

1805 UTC: Little change since the last post. Gusty winds continue to run from 15-20mph, essentially from the west. Scattered shallow Cu racing by indicating winds just off the surface are pretty stout. In talking with Stephen Chan (UVA) at the flux site, he indicated the morning sounding had winds  $\geq 15 \text{ ms}^{-1}$  for the duration of the balloon flight. Radar still scanning clear of any precipitation though clutter from sea spray being kicked up by the strong wind is evident off the coast on the  $0.7^\circ$  tilt. CSF

1816 UTC: Strong winds – gusts up to 30 mph from the SW. While standing down at the flux tower, dust blew into my eyes but from an onshore direction. AER

1845 UTC: Skies continue to clear to the East although it is hazy around the radar site. Cloud deck filling in just onshore where the 2 cloud streets previously were. AER

2015 UTC: Severe clear. Raidosonde launch earlier (~1800 UTC) showed a 21 m/s low level jet around 750-700 mb. Surface winds are still very strong as well. AJN

2200 UTC: Severe clear. Quite a bit of AP over the ocean. Sea spray or seeing the waves/ocean surface. We are lighting up Dakar some with a weak side lobe ring as a result. AJN

2300 UTC: NPOL stopped radiating again. Re-started the scans and if fired right back up. What is causing it and why is it only happening during the night shift? AJN

8/24/2006:

0100 UTC: NPOL seems to be working fine again... Last radiosonde launch (0000 UTC) went well. AJN

0230 UTC: A small area of echo has been approaching from the ENE for a little over an hour. It is still outside of 150 km and is very weak. It is creating some second trip echo when NAMMA\_FAR-S is running. AJN

0250 UTC: We got a little sprinkle, but nothing is showing up. So whatever out there is very weak and very local to right over the radar. AJN

0500 UTC: Clear at the radar. NPOL may be picking up some anvil out around 150-200 km to the ENE through ESE. Weak echoes out there showing up through around 2.0° elevation. AJN

0700 UTC: Relieved the night crew. Low level cloud deck. Very windy at the surface from the NE 10 kts gusting to about 30 kts. Note there are lots of bugs in the science container. We need to figure a way to reduce the bugs. PAK

0800 UTC: No Significant Weather. Some ground clutter targets and sea clutter. PAK

0900 UTC: See 0800 UTC. PAK

1100 UTC: I have finished mapping products to npol2. Because npol1 has the license for producing polarimetric products, I have PPI's and CAPPI's generated npol1 and sent to npol2. npol2 then sends the products to trmm-linux4 and trmm-linux5. I created a PPI and CAPPI product for all conventional and polarimetric products. PAK

1200 UTC: No Significant weather. PAK

1252 UTC: Noticed the transmitter was off. I will have to let Lester know about the issue. So, it is not just a night problem. The conditions still remain overcast with a strong NW wind at 15 gusting to 20 mph. Paul L. and I fixed the anemometer. It was off by about 30 deg to the South. PAK

1300 UTC: No luck on the RAID. I am giving up for now. Matlab is installed and running on npol2. PAK

1400 UTC: No significant weather. PAK

1545 UTC: Echo! Well, not too exciting. A few weak echoes are beginning to be detected to the ENE centered at a range of 100 km (East of AMMA 31). Max reflectivity is in the low 20 dBZ. It looks to be diurnal convection. PAK

1700 UTC: We have convection. It looks like deeper, more organized convection is developing just beyond the 150 km range of the volume scan to the ENE. Reflectivity is exceeding 40 dBZ at this point. This will need to be monitored closely as we expect the development of a significant system tonight, into tomorrow. PAK

1830 UTC: Took the system down to remove noise sampling during the event. Convection continues to build to the E. The leading edge is now within 150 km. There is a considerable amount of 2<sup>nd</sup> trip in the volume scans with the main cells outside 150 km. Reflectivity values are exceeding 50 dBZ in the cores. PAK

1915 UTC: Night crew relieved the day crew at 1900 UTC. Currently monitoring convection to our northeast (running in azimuth from roughly 50° to 110°) which is apparent through the 5.7° tilt. Range is from 110km to 150km with little behind it per the surveillance scan. Max dBZ is currently 49 at a bearing of 87° and range of 118km. It appears the area of convection appears to be sliding to the southwest. Will continue to monitor as the night goes on. CSF

2040 UTC: Complex to our east continues to progress southwestward. Last surveillance scan at 2030 UTC showed the closest portion of the complex now 100km from the radar location at a bearing of 90°. Max dBZ remains in the upper 40's though a downward trend does appear to be taking place over the past 30 minutes or so. Extent of the higher reflectivity values is currently confined to the leading edge of the complex with dBZ's of around 30-35 behind this. There does appear to be some building on the northern extent of the complex but if current trends continue, the bulk of the precipitation will stay to our east. Winds are certainly lighter than they have been during the last 48 hours. Currently from the west-northwest at 5-7 mph. CSF

2120 UTC: Still monitoring precipitation complex to our east. Reflectivities appear to have stabilized in the last 45 minutes. There is some indication of a mesoscale vortex trying to form at a bearing of 105° and range of 160km when viewing a loop of the last few surveillance scans. Precipitation developing to the southeast of that area appears to be moving toward the north while the main bulk of the precipitation continues a south-southwestward movement. The precipitation also appears to be breaking into three separate areas. The northern area has moved approximately 25km in the past 30 minutes and just missed AMMA 39 to the southeast. AMMA 37 and AMMA 35 do appear to be in line for precipitation if current radar trends continue. Now noting reflectivity returns all the way up to the 11.3° scan in this area. The middle area is the smallest of the three and lies due east of the radar. The southern area continues to display the strongest reflectivity but is well south of both the dense and large-scale rain gauge networks. CSF

2215 UTC: Complex has really decreased in intensity in the past hour. Most reflectivity now  $\leq 35$  dBZ. Latest surveillance scan shows a large area of very light stratiform precipitation forming to the east of the initial complex but it's too soon to tell if this will reach the area. Does appear light

precip is currently falling at AMMA 37, AMMA 35, and AMMA 34. Don't know if AMMA 34 is operational in terms of collecting rainfall data as there was an issue with the data loggers not being initialized when they were deployed back in June. Andy Newman and Samo Diatta are scheduled to visit this location tomorrow. Closest return at this time is 65km at a bearing of 88°. Continuing to monitor. CSF

2330 UTC: Precipitation has exhibited a steady decrease in intensity during the last hour. Still spotty dBZ's > 40 but majority are now below 35. Large area of stratiform precipitation noted previously has also begun to decrease in aerial coverage. Surveillance scan shows additional cells starting to form roughly 200km to the northeast. Will monitor these developing cells to see if they can hold together long enough to make it to the gauge network. CSF

8/25/2006:

0100 UTC: Original area of precipitation has essentially dissipated. A few cells still ongoing over northern Gambia but continuing to move southward. Developing cells to the northeast continue sliding southwest as the prior complex did. Haven't exhibited any significant strengthening in the last 90 minutes but will continue to monitor. Moving over the same general area as previous system did as well so same gauges might receive precipitation again. Unsure yet if it will make it to the dense network. On a side note, still experiencing a MAJOR bug issue in the science container. Appears to be related to the fact there is no cover on the window of the front door glass. Wonder if there would be some way to cover it during the night shift to reduce the number of bugs attracted by the interior lights? CSF

0215 UTC: After watching the precipitation area tonight it appears that there is a ZDR bias of 1.5-2.0 db, maybe more. Also, RhoHV seems to be suppressed even lower than the scans examined from before NPOL was shipped here (0.88-0.95 was very common). This may be due to the fact that the echo was fairly far away, somewhat weak and not overly large in coverage (i.e. low SNR, non-uniform beam filling effects). That being said, there were still areas where RhoHV should have been higher. Phase information may be noisy as well, KDP seems to be more so than it normally is, but a visual examination of PhiDP was inconclusive. AJN

0315 UTC: Circulation center to the ESE is still trying to spin some precipitation to the SW over NPOL, but with little success. The 40 km range ring seems to be a magical barrier. Convection isn't overly strong or organized and the areal extent seems to still be lessening with time. Is there still an elevated dry layer over the area that's killing this system? AJN

0420 UTC: Well... What looked like a promising night of convection at the beginning of the shift has slowly but surely evaporated. While there are still a few light showers to the northeast of NPOL in the vicinity of AMMA

39, they continue to diminish in both aerial extent and intensity. No new cells have formed in the past few hours so the chance of seeing measurable precipitation at the radar site is slim to none. It should be noted that Marcia and Segayle reported feeling a few drops of rain as they were preparing their 0300 UTC sonde launch. Doubtful it was enough to even tip the bucket once on AMMA 22 and AMMA 23. Will continue to monitor but looks as though things will continue to quiet down during the balance of the shift. CSF

0515 UTC: Precipitation to the NW continues to weaken. There are a few somewhat stronger showers over 200 km SSW off the coast of The Gambia. AJN

0550 UTC: NPOL stopped scanning. Message from IRIS was that it stopped the scan after 21 seconds of unusable data. Re-started scans and NPOL fired back up. On a side note, the precipitation to the NW has dissipated. There are still showers off the coast of The Gambia. AJN

0635 UTC: Some convection is firing off to the N thru E in scattered cell form. First echo was detected on the 0615 scan with further development through the 0630 scan. AJN

0700 UTC: A small area of showers/shallow convection (5-7 km deep) to the NE is the result of the last half hour of development. Its sprinkling at the radar just a bit. AJN

0730 UTC: We shut down because the generator was overheating. The belt for the radiator fan was loose and slipping. Lester tightened the belt. PAK

0845 UTC: We are operational. The generator seems to be running well. We are still seeing some convection to the North. Nothing is very organized but should provide some example for the official state visit. PAK

0900 UTC: All computers are functioning and back online. PAK

0940 UTC: The official visit has begun. There is a line of convection building to the north extending down just north of the radar. PAK

1330 UTC: The official visit has ended. It went very well. We visited with the US Ambassador and various ministers. A speech was given by various officials. On the weather side, Convection continues to develop to our north. There is rotation centered off the coast of Senegal, north of Dakar. The convection is becoming more organized in a N-S line with a stronger system just to the N of us. The banded feature then rotates N and W out over the ocean. The project office is forecasting this to become into a tropical depression. PAK



1515 UTC – We stopped the scans to change the ZDR bias. Analysis showed a bias of about 1.5 dB (it actually might be more). We have scattered convection to our N and E of us. The DC-8 is planning some coordination with NPOL in the next hour or so. PAK

1530 UTC – Back scanning with the new ZDR bias of + 1.0 dB (Note, the stored bias from Oyster was -0.62 dB so the net correction was +1.62 dB). PAK

1600 UTC – We increased the ZDR bias to +1.8 dB based on the bird bath. It now looks too high by about 0.6 dB. We will keep it there until the DC-8 leaves the region. PAK

1645 UTC: NASA436 made contact with NPOL. They worked a small line that was located about 30 km to the SSW of NPOL. It was orientated from WNW to SSE. The length of the line is approximately 75 km. Maximum reflectivity was about 43 dBZ with echo top heights not exceeding 8 km.

1700 UTC: The line continues to move to the NNE at about 10 km/h. The DC-8 is in a holding pattern waiting clearance. They are flying near a smaller line to the east of the main line, which is located about 35 km SE of NPOL.

1715 UTC: The DC-8 has been cleared to work the line to the SSW of NPOL. The line continues to move north and maintain the vertical structure and intensity as observed in the previous scans.

1731 UTC: The DC-8 is finishing up the last segment and moving out for the flight back to CV.

1815 UTC: The line has moved over NPOL and dissipated except for a few isolated cells.

Note: the Radio communications worked very well during the mission.

1834 UTC – The line of convection has merged with other remnants and continues to move to the North. It is not very impressive at this point. The ZDR bias looks much better. Based on the MATLAB analysis, we adjusted the ZDR bias offset to +1.2 dB. PAK.

1900 UTC: Night shift relieved the day shift. Band of convection continues to move northward away from the radar. Appears most, if not all, of the large and dense network rain gauges received some precipitation today. Changes to the ZDR bias appear to have been successful. Will continue to monitor the progress of the remaining convection throughout the night. CSF

1956 UTC: Before nightfall, thick clouds overhead which were likely associated with anvils from shallow storms to our E. There was a rainbow, which Chris said was a double rainbow for awhile. He has pictures. AER

2045 UTC: Storms to our E are dissipating. There are large sidelobes from Dakar at 30° and 150° azimuth during the Surveillance scan. AER

2133 UTC: Cell just moving offshore at 330° between 20 and 40 km range. There is a discontinuous line of shallow storms which roughly follows the coast, but the cell just N of the peninsula (mentioned above) is by far the strongest with maximum reflectivity of 45 dBZ and topped by the 8.2° elevation scan. AER

2200 UTC: Checked water temp on the generator. Sitting at 180°F on the nose. Will monitor every few hours to make sure it's not getting too hot. CSF

2215 UTC: Small cluster of cells popped up on the coast at 150° between 100 and 140 km in range. There is also some development of a few cells to the N off of the coast within the discontinuous line of storms mentioned at 2133 UTC. Nothing looks too impressive at this point but there has been some strengthening of the cells as they transitioned offshore. AER

2233 UTC: For the cells to the N off of the coast the 0.7° scan showed velocities up to 10 m/s with NO suggestion of rotation. AER

2245 UTC: The two cells on the coast to the S appear to be weakening slightly. AER

2323 UTC: The Project Office in Cape Verde believes that the line of storms along the coast to the N will strengthen into a tropical depression once they encounter a low pressure trough further to the W over the Atlantic. AER

8/26/2006

0046 UTC: The line of cells to the N appears to be merging and becoming noticeably stronger, although NO rotation indicated at this point from the velocities. However, the convection is not very deep. Reflectivity weakens considerably at the 1.8° elevation scan and the cells are topped completely at the 8.2° elevation scan. AER

0100 UTC: The cells to the S are moving away from the coast out over the sea. They appear to be spreading out and weakening. The cells along the coast to the N continue to strengthen with maximum reflectivities of 45 dBZ and +15 m/s velocities. There appears to also be a large scale cyclonic circulation which seems to govern the overall motion of both sets of cells to

the N and S of the radar, although no organized rotation has formed yet.  
AER

0107 UTC: Water temp on the generator still sitting at exactly 180°F as it should be. CSF

0331 UTC: Cells to the S have weakened offshore but have developed into an MCS inland with additional precipitation developing to the E. Maximum reflectivities associated with the MCS were 45 dBZ at 124° azimuth and 65 km range. AER

0430 UTC: MCS continues to build inland 70° to 160° azimuth and 40 to 80 km range. In the strongest parts of the storm maximum reflectivities were 45.5 dBZ. AER

0434 UTC: Generator still operating normally. Water temp at 180°F. CSF

0615 UTC: Checked generator again. Still functioning normally. CSF

0635 UTC: Filled flux site generator. CSF

0636 UTC: Although still building to the N, the MCS has weakened substantially in terms of reflectivity (most of the system has 18 to 21 dBZ reflectivity measurements) and structure (line not as solid as it was at around 0330 UTC this morning). AER

07:30 UTC: Changed data DVD.

NPOL 1 DVD

Np1\_06\_08\_22\_ODE

Start: 11:12:29 Z 08/19/2006

Stop: 06:45:51 Z 08/26/2006

Total Files: 1071

AKT

08:15 UTC: Most of the precipitation has weakened with showers mainly to the North and Northeast of NPOL with some small lingering showers elsewhere in the viewing area. There was precipitation located over the entire dense gauge network from 06:00Z to 7:00Z. AKT

11:30 UTC: The showers to the North have mostly dissipated with a shower near 200km. There are a few cells/showers between 0° and 120° oriented NW-SE. The showers are moving Northward at approx. 7-8 m/s. AKT

13:30 UTC: There was an error with the surveillance scan, there is only about 1/3 of the data showing up on the product display. Just this one scan, none of the others have been affected at the time being. AKT

17:00 UTC: Widely scattered showers from 0° - 180° moving Northward. Radar is running good.

1900 UTC: Night crew relieved the day crew. There are a few showers to the E but they are small and appear to be dissipating. Other than that, it looks like we're in for a severe clear night. Winds from the SSW at 5 mph gusting up to 13 mph. AER

2100 UTC: Large sidelobes from Dakar present on the Surveillance scan. There is also a large area of low reflectivity (approximately 10 to 12 dBZ) at 90° azimuth although it does not look like precipitation. It could possibly be a clear air signature or the result of beam bending due to an inversion. AER

2200 UTC: Winds have switched to S/SSE at 2 mph (light and variable). Two cells have developed to the S – one near Kaolack and the other along the inlet on the coast at 155° azimuth and 105 km range. Interestingly, convection built in the same location along the coast last night. AER

2218 UTC: Winds from E at 2 to 3 mph. AER

2314 UTC: Messages from IRIS:

Scan stopped after 21 seconds of unusable data.

DSP AZ Angles exceed 30 degree span: 67 to 0

This appears to have come up after the volume scan started at 2300 UTC. The next volume scan started on time (2315 UTC) without a problem. Chris is looking at data from the 2300 UTC volume scan to make sure everything looks OK. This also occurred shortly after I noticed that the radar container did not feel as cool as it normally does. It is still 70°F in the container so we will continue to monitor the transmitter to make sure that it doesn't over heat. AER

2315 UTC: Checked on the generator. Water temp setting at 180°F and running normally. CSF

2316 UTC: The cell near Kaolack has almost fully dissipated. However, there are now 2 cells inland from the coast at 150° and 100 km range currently moving N. AER

8/27/2006

0023 UTC: Cells to the S strengthening. AER

0203 UTC: Cells to the S have transitioned into a linear formation and are now moving offshore. Within the line, there are still 2 distinctive convective regions (likely from the 2 cells that were present before) but now there is a trailing stratiform rain region to the N. AER

0224 UTC: Transmitter went to “Stand by” mode (radar still turning, but not sending out any pulses). We stopped the scan and rescheduled it to start again at 0230 UTC. (The 0215 UTC volume scan is therefore incomplete.)  
AER

0230 UTC: About half a minute before the surveillance scan was supposed to start, the transmitter switched to radiate “On” light and the surveillance scan commenced as scheduled. AER

0245 UTC: The radar is running fine now. The Surveillance scan showed additional precipitation at 100° azimuth and 250 km range although it appears to be moving to the E and dissipating (at that distance from the radar we are only able to see high up into the storm – beam height is around 7 km). The precipitation to the S is moving offshore and the trailing stratiform region has disappeared. From a loop of Surveillance scans, a land breeze is apparent just off the coast between our location at Kawsara and Dakar. Winds here are from the E at 4 mph. AER

0400 UTC: The line of storms over the sea is weakening significantly, although there are still some cells that appear to be strengthening. AER

0500 UTC: There is a thin line of convective storms around 200° azimuth from 75 to 150 km range (NOT range folded). AER

0545 UTC: Checked on the generator again. Operating normally. CSF

0700 UTC: Shift Change. System seems to be running fine. PAK

0727 UTC: On the drive back to Saly we could see the convection out over the ocean associated with precipitation at 200° from 75 to 150 km range on the radar. The observations on the radar display associated with this precipitation have not changed much since 0500 UTC. AER

0900 UTC: We did a solar calibration today. The values look reasonable. Andy will get the solar flux from the website today for comparison. PAK

1200 UTC: Pretty quiet on the radar today. There are a few scattered showers over the ocean. Echoes are ~10-20 km in size with tops reaching about 5 km. Max reflectivity is ~40 dBZ. PAK

1215 UTC: Visited with Ed at the project office. The DC-8 will be flying west today and have 2 hard down days on Monday and Tuesday. The next fly day will possibly be Wednesday. PAK

1315 UTC: Continues to rain lightly at the site. More scattered showers are developing just inland to about 40 km from the ocean. Sea breeze/diurnal heating convection? PAK

1345 UTC: Started NAMMA\_NEAR. We have moderate to heavy showers near and over the radar. PAK

1445 UTC: Started NAMMA\_FAR. Showers have moved away from the radar. PAK

1509 UTC: When I went to lunch (at the hotel in Saly) around 1430 UTC, there were a few large drops falling outside (perhaps from anvil). After lunch there was a steady light sprinkling of rain likely from a storm to our N. Deep tropical convection was occurring in all directions as well. AER

1745 UTC: We continue to have isolated convective cells scattered around the radar (mostly over land). The echoes tend to be weak. Mostly warm rain precipitation. PAK.

1900 UTC: Night crew relieved the day shift. Scattered convection currently present from the radar site to the north. Another area of precipitation is located east of the radar. Loop of recent surveillance scans shows a slow movement to the west and southwest. CSF

1937 UTC: Precipitation visible from the radar producing lightning. AER

2000 UTC: Convection continues to slide ever so slowly toward the west. Light rain currently falling at the radar site with heavier reflectivities to southeast. Highest dBZ is 49 at an azimuth of 120° and range of 119km. Appears system is beginning to increase in aerial coverage to our east as well. Will monitor. CSF

2049 UTC: A line of cells is organizing at 120° azimuth and 50 to 170 km range. AER

2130 UTC: Complex of convection to our east has increased substantially in the last 90 minutes. Should be getting quite a bit of precip at AMMA34 right now as well as the far eastern side of the dense gauge network. This convection is moving in more of a south-southwesterly direction at the present time. Strongest cells are now pushing 13-15km in height. CSF

2145 UTC: Appears convection to our east is beginning to form into an MCS. Aerial extent of >40 dBZ reflectivity dramatically increased just in the past 30-45 minutes. Now essentially covering an area bounded by bearing from 97°-118° and range from 50-100km. Nothing more than scattered convection when the shift began. Will be interesting to watch as

the system continues to develop throughout the night. AMMA 34 squarely in middle of heavy precipitation at the present time. CSF

2203 UTC: There is onshore flow surging into the forming MCS indicated from velocities (maximum velocities found were +/- 6.2 m/s. AER

2238 UTC: The MCS is moving offshore and appears to have a leading stratiform region. AER

2305 UTC: The MCS appears to be filling in, as seen from the reflectivity field, along a line of convergence which is about 25 km S of the radar. AER

2352 UTC: Chris reported lots of lightning to our S.

2345 UTC: Checked on the generator. Operating normally. CSF

8/28/2006

0016 UTC: It is now raining at the radar location. This is IMPORTANT to note due to the wet antenna problem (causes reflectivity returns to be less than what they actually are). AER

0030 UTC: From loops of surveillance scans, the system as a whole has moved to the N although the largest area of highest reflectivity (about 45 dBZ) has moved to the S once it passed the coast. AER

0200 UTC: Several strong cells are embedded within the larger stratiform region over the ocean. Max reflectivity: 50.8 dBZ at 230° azimuth and 42 km range. There is also very weak rotation just to the left of the max reflectivity region listed above – although this rotation has appeared in just this last surveillance scan loop. There was also a wind shift from W (onshore flow) to E (offshore) flow within the last hour. AER

0233 UTC: Convective portions of the MCS are transitioning to the leading portion of the stratiform region over the sea. AER

0302 UTC: There is a light sprinkling of rain outside the radar currently. AER

0345 UTC: 24-hour rain accumulations show up to 57.5 mm (approximately 2 inches) of rainfall in the past day. 42.5 mm fell near the AMMA33 and AMMA34 rain gauges. AER

0402 UTC: The precipitation field has moved offshore almost completely at this point. There are two closely spaced convective area just W of Dakar. AER

0508 UTC: On the 0445 and 0500 UTC surveillance scans there is a thin line of reflectivity that was oriented along the 113° (at 0445 UTC) and then the 120° (at 0500 UTC) azimuth. Chris and I were both wondering what might be causing this feature. My only guess from the time that we are at is that it could have something to do with the sunrise to the E at a far distance. AER

0555 UTC: The MCS has weakened somewhat, disbanding into 3 “spokes” of stratiform rain although one band still has a convective portion that has moved westward from Dakar (mentioned earlier at 0402 UTC).

0601 UTC: Although the stratiform rain region has broken apart and diminished in size, the band with the portion of embedded convection that moved westward from Dakar continues to move out to sea and does not appear to be weakening significantly. AER

0730 UTC: We brought NPOL down for maintenance -> oil change. Most of the convection was beyond the 150 km range of NPOL. PAK

0930 UTC: Back in operation. The oil change went very well. No precipitation is being observed by the radar. PAK

1030 UTC: Severe Clear. PAK

1645 UTC: Lester and I discovered that the ZDR bias was +2.2 dB based on data analysis and looking at the noise sample values. This was because we turned off automatic noise sample so the system took the power up noise sample when we restated the computers after the generator overheated. So the ZDR values we not correct since Fri, 25 August. The net ZDR correction now that we have the correct noise lever is -1.0 dB. PAK

1820 UTC: Well, it has been an interesting day. Lester and I had to drive into Saly to get a different battery for the car. We then drove back around 2 PM. We worked on patching IRIS and getting the ZDR offset correct. There has been scattered isolated convection in the area, but nothing too exciting. Tops were around 8 km with max reflectivity in the cores around 45-50 dBZ. Most of the convection initiated over the highlands E and S of NPOL. Roger-dodger-over-and-out. PAK

1915 UTC: Night shift relieved the day shift at 1900 UTC. Review of current radar shows very widely scattered light convection to the east of NPOL at a bearing of 90° and range of 95km. Loop of surveillance scans from the past 2 hours shows a general decrease in both aerial coverage and reflectivity. CSF



2000 UTC: Isolated convection continues to the east and appears to be pulse convection that is likely diurnal in nature. Anticipate it to diminish soon as the sun is now setting. CSF

2100 UTC: Convection to the east diminishing now but new convection has developed off the coast at a bearing of 185° and a range of 120km. Max dBZ currently is 52. Another cell currently developing along and south of the Senegal/Gambia border at a bearing of 152° and range of 146 km. Note a lot of clutter on the latest surveillance scan which appears to be likely related to insects since it popped up only after the sun went down. Note there is a dramatic increase in bugs outside the seatainers tonight as compared to the previous 4 nights. They are beginning to find their way into the science container again. Checked on the generator which is operating normally. CSF

2150 UTC: Storms off the coast and to the south continue to hold together. Highest reflectivity currently on the radar is 58 dBZ at a bearing of 185° and range of 105km. Review of the cross section shows the storm to be very shallow with a top of just under 8km. Cells to the south are moving to the northwest and could approach the radar site by dawn if it holds together and continues on its present path. CSF

2255 UTC: Both the areas of convection have begun to dissipate over the last 30 minutes with the precipitation just south of the Senegal/Gambia border almost completely gone. No new development has occurred in the surveillance area. CSF

2350 UTC: Overall downward trend in aerial coverage and reflectivity continues. Strongest convection showing ~40dBZ but it's well out to sea at this point and continuing to move away from the radar site and land in a northwesterly direction. CSF

8/29/2006

0051 UTC: Convection out over the ocean has essentially dissipated while storm just off the Senegal/Gambia coast continues to pulse up and down occasionally reaching 50 dBZ. Like the earlier convection, it's very shallow with tops < 8km. Of new interest is convection which began creeping into the surveillance area on the 0030 UTC scan. Current area is beyond 250km at a bearing from 50°-87°. Will keep an eye on it. CSF

0203 UTC: Area of precipitation to the east-northeast continues to approach the radar site. Currently stretches from bearing of 45°-92° and range from 163km to the edge of the surveillance area. Highest reflectivity as of the 0200 UTC surveillance scan was 55 dBZ at bearing 55° and range of 173km. Appears there is a southward extent of this convection that is now

entering the coverage area between 105° and 120° azimuth. Unknown yet if this truly is one single complex or two separate complexes. CSF

0305 UTC: Convection continues to move toward the west-southwest at ~50km hr<sup>-1</sup> and expand in coverage. Precipitation now located between 36° and 120° azimuth with the closest cell being 110km from the radar. Max dBZ currently sits at 45. There is a large area of what appears to be stratiform precipitation behind the initial stronger cells. Appears to be taking on MCS characteristics. CSF

0330 UTC: Perhaps the beginning of a squall line forming? Rapid development in the past 30 minutes oriented NW-SE beginning just northeast of AMMA 39 trailing southeastward to east of AMMA 37. Convection east of AMMA 37 wasn't there as of 0300 UTC. Velocity scans not currently showing any rotation to this complex but will monitor. CSF

0442 UTC: Well... What looked like a squall line forming is turning out to be nothing more than a broken line of convection that's not very intense. The southeastern edge of the line has fizzled while the rest has begun to move in more of a westerly direction. The area of stratiform precipitation has also begun to decrease in coverage. A few strong cells remain off shore to the southwest of NPOL though they are continuing to move westward as well. Winds have shifted from the northwest to the northeast as we might be getting some outflow from the convection to our northeast. Currently running about 5-8mph. CSF

0530 UTC: Most of the convection has now dissipated with only a fairly small area of stratiform precipitation remaining to the east beyond 100km out and bearing from 60°-120°. There are a few stronger cells which have developed down along the Gambia River but those storms are moving to the west-southwest. Winds now vacillating between north-northwest and north-northeast running around 5mph. Generator temperature still running normally. CSF

0645 UTC: Stratiform precip to the east at a range of 150km continues to shrivel up. There is convection ongoing along the coast in Gambia just south of the Gambia River but it continues to move to the west-southwest and away from the radar. Max dBZ in the mid 40's with tops of 8km and below. CSF

0724 UTC: Power to transmitter stopped. Appears to have stopped before 0715 UTC surveillance scan but after 0700 UTC. (211.6° azimuth and 8.3° elevation) AER

1030 UTC: Power to transmitter restarted. AER

1045 UTC: First scheduled radar volume scan since transmitter power restarted. Everything is running smoothly again. AER

1047 UTC: MCS visible on the Surveillance scan to the SE. Range folding occurring. AER

1202 UTC: MCS moving SW. AER

1217 UTC: MCS moving off the coast at 160° azimuth with leading line between 100 and 120 km range. There are a few gates with >50 dBZ reflectivity. Unfortunately, it looks as though this MCS will pass to the S of the large rain gauge network. AER

1301 UTC: MCS has moved out over the ocean. The trailing stratiform rain region has become discontinuous as it falls apart. AER

1340 UTC: Cell popped up just to our SW off of the coast at 15 km range and 178.8° azimuth. RHI's show cell is already extending above 12 km with overhang and an elevated precipitation core showing above 50 dBZ reflectivities. AER

1403 UTC: There are now two areas of maximum reflectivity just off of the coast from where the single cell at 1340 UTC previously was. There are additional small cells that are developing over land and appear to be feeding into the rear of the developing MCS. AER

1435 UTC: Winds have picked up outside (gusting up to 18 mph). The flux tower team was unable to release a sonde due to wind gusts. Velocities on the radar show a SSE wind with a maximum speed of 4.2 m/s. AER

1440 UTC: Light rain starting to fall at the radar. AER

1450 UTC: After looking more closely at a loop of Surveillance scans over the past hour, I have noticed a boundary (perhaps from cold pool outflow from MCS that moved offshore at 1301 UTC) that is oriented SW to NE and propagating in a NW direction towards the radar. It is likely that this boundary either caused the convection that resulted in the cell that popped up to our SW or resulted in its intensification over such a short period of time. AER

1503 UTC: Rain stopped at radar. AER

1800 UTC: Most cells have out of radar range of NPOL. The radar seems to be running well since the repairs from the shorted wire this morning. PAK

1900 UTC: Relieved the day crew. Looks like a night of severe clear for the most part. There is one lone isolated shower to the east at a range of 125km moving to the northwest. CSF

2005 UTC: Shower to the east has dissipated. Now getting ground clutter inside of a range of 40km. Likely related to insects much like last night. Severe clear otherwise. CSF

2200 UTC: Severe clear continues. CSF

2337 UTC: No significant weather at this time. Helped flux site with 2330 UTC sonde launch. They plan on launching again at 0530 UTC. CSF

8/30/2006

0045 UTC: Checked generator which continues to operate normally. Severe clear remains. CSF

0148 UTC: Severe clear no more!! In the past 15 minutes a cell has rapidly developed just off the coast, due west of the radar and south-southeast of Dakar. Current max dBZ is around 48 with tops ~8km. Also appears there is some sort of boundary or land/sea convergence taking place all along the coast southward past Saly. Will monitor for further development. CSF

0255 UTC: Area of convection continues to grow and intensify. 0230 UTC volume scan (NAMMA\_FAR) showed highest reflectivity of 50 dBZ at a range of 27km and bearing of 260°. Closest convection to the radar was 11km away at a bearing of 215° with the highest reflectivity being 45 dBZ. Highest tops are on the order of 8 km at the present time. Went outside but saw no evidence of lighting associated with this convection despite the modest reflectivity values. Marine vs. continental initiation the reason or is it more a function of the shallowness of the convection?? Additional cells have developed along the coast south of the radar toward Saly. CSF

0334 UTC: Almost all convection is within 40km and some is within 15 km which would make this a near-perfect case to run the NAMMA\_NEAR scanning strategy but will hold off on that given no prior approval to make the change. Aerial coverage continues to increase but intensity has remained the essentially the same. Tops still remaining in the vicinity of 8km. CSF

0453 UTC: Storms near the coast have begun to dissipate with tops < 5 km and reflectivity falling below 40 dBZ. There is one strong cell southwest of Dakar over the ocean with tops still in the vicinity of 8 km. Nothing new has developed recently. Winds have flipped from northerly to southwesterly in the last hour but are very light (1-2 mph). Generator is operating at normal temp (180°). CSF

0551 UTC: Most convection has dissipated entirely. Only reflectivity left is at a bearing of 265° and range of 120 km continuing to move westward. Helped launch the 0530 UTC sonde. CSF

0637 UTC: Severe clear reigns once again. Wind now back to a northerly direction and still very light ( $\leq 5$  mph). Generator water temp is normal. CSF

0700 UTC: Transmitter kicked off during the scan. We restarted without any problems. No significant weather at the moment. PAK

0742 UTC: Convergence along coast around Dakar out to 50 or 60 miles N and S of the city. It is likely from sea spray, although I am not entirely sure. This area of convergence has also caused convection to quickly pop up off of the coast. AER

0815 UTC: There is a small line of precipitation that developed over the ocean at 74.8 km range and 165.5° azimuth and continues to propagate to the SW. AER

0915 UTC: Shallow marine cumulus below 10 km. AER

1015 UTC: There is no data for the 0945 and 1000 UTC volume scans, however the radar volume started at 1015 is working fine. AER

1200 UTC: Shallow marine cumulus cell popped up at 120 km and 181.1° azimuth with a maximum reflectivity of 24.2 dBZ. AER

1216 UTC: The sidelobes from Dakar for the Surveillance scan are bigger than normal. There is a spike in reflectivity along the 194° to 204° azimuth rays out to 50 km range. There is also shallow convection along the coast (inland) out to 65 km in range from the radar with low reflectivity values around 20 dBZ. AER

1300 UTC: We had a few scattered cells develop over the ocean, but nothing more than warm rain convection. We were interviewed this morning by the Writers (Rueters?) Association by Gabby Matthews. The news article should be sent out by this afternoon to the US. I am off for the day. PAK.

1301 UTC: The cell mentioned in the report at 1200 UTC previously is now at 116.4 km range and 187.0° azimuth with a maximum reflectivity of 40.2 dBZ. Visual observations outside are that it is humid and hazy with lots of shallow convection around the radar. AER

1902 UTC: Looks like we're in for a clear evening. Nothing on the radar for several hours now (except maybe for some rather large side lobes from Dakar). AER

1920 UTC: Night shift relieved the day shift.

1955 UTC: Some echo outside of 200 km, to the SE, showing up on the surveillance scan. It doesn't look like it will amount too much but its something to watch. AJN

2015 UTC: Upon closer inspection the second trip echo is actually indicating some fairly impressive convection off to the SE. The second trip echo is still present through 2.0° elevation and the actual echo is over 200 km away so that gives cores over 10 km up with earth's curvature figured in (7.7 km on flat earth at 200 km). AJN

2100 UTC: Cores off to the SE max out at around 38 dBZ at 220 km away. This is south of Gambia and in southern Senegal. Still creating impressive second trip on the NAMMA\_FAR\_S scan. Light to moderate AP around the radar tonight so maybe the beam is somewhat lower than the 4/3<sup>rd</sup> earth approximation would expect, helping us to pick up these cells so far away. They are still the only show in town and they appear to be moving due west or just south of west. AJN

2215 UTC: Strong cores (max reflectivities around 45-47 dBZ) off to the SE at 200-270 km away moving WSW and beginning to build on the northern edge. Second trip on the NAMMA\_FAR\_S scan is still the only noticeable result of this convection. Too bad this system wasn't 200 km farther north. AJN

2315 UTC: Convective line is building NW into The Gambia and can barely be seen on the NAMMA\_FAR\_S view out at 149 km to the SE. They appear to be following an outflow boundary to the NW by the way they are developing and propagating. AJN

8/31/2006

0000 UTC: Intense AP or some sort of clutter/noise/interference in the NE quadrant has developed over the past 30 minutes. I'm not sure what is causing this. I don't think it is second trip because its similar on the surveillance scan and its almost continuous out in range to 150/279 km, but it is only along a 30-40 degree area, from about 7 to 45 degrees. AJN

0045 UTC: Problem with NPOL. There is a problem with the elevation sensors, apparently something with the slip ring according to Lester. Stopped during the 0030 scan. Tried to work through it but the scans failed

when we re-started at 0045 UTC. We are going to wait until 0130 UTC and try one more time. If it fails again we'll wait for Lester in the morning. The convection to the SE is now to the SSE and somewhat impressive (a couple stronger cells), but still over 100 km away. It doesn't look like it will get all that close to NPOL. AJN

0150 UTC: Re-started NPOL at the 0145 scan and so far so good. The convection to the SSE has gotten closer and it is a broken/almost solid line from around 171° at 120 km NE to around 97° at a range of 110 km. There is no trailing stratiform region, only the convective line, which is about 10-15 km deep. It is all moving to the WNW/NW and it now looks like it may get close if it holds together. Note that the weird returns in the NE quadrant are still there and that is where the antenna was having problems. Could these be related? AJN

0220 UTC: NPOL has been working fine for the last 35 minutes. It has completed 2 full volume scans and its working on the 3<sup>rd</sup> since the re-start. Convective band to the SSE-SE has moved inside 100 km and is approaching AMMA 40. It is starting to break apart with new development over the ocean to the S and SW around 45-80 km. AJN

0250 UTC: The line is now two distinct areas of convection. The southern most one is moving off the coast while the northern area is moving toward AMMA 40. The southern cell has maximum reflectivities of around 46 dBZ while the northern cell has reflectivities around 42 dBZ (base sweep of NAMMA\_FAR\_S). The main difference is in the depth of the cells. The northern cell's 20 dBZ contour tops out at around 17 km and the southern one tops out at around 16 km. Six or more newer cells are now clearly evident over the ocean and are mainly in the SW quadrant between 50-90 km away from NPOL. Tops are lower on these cells. The 20 dBZ contour is as high as 7-8 km in these cells currently with maximum reflectivities (base sweep of NAMMA\_FAR\_S) of 40-46 dBZ. AJN.

0400 UTC: Any stronger cell seems to back build to the east or is nearly stationary in movement. There has been a new cell blow up just offshore to the SW of NPOL over the past hour. Some second trip echo is occurring to the ENE. The surveillance scan shows that there is something bigger lurking to the far ENE/NE. AJN

0445 UTC: Convection to the SW of NPOL that was an ancestor from the original line has laid an outflow boundary that NPOL is picking up to the SE and it is moving NW towards NPOL. There are several cells over the ocean: two to the WSW at around 25 and 55 km, two to the south at around 30 km and 90-110 km and one to the SW at around 65 km. Maximum base sweep reflectivities from these cells ranges from around 40 to 50 dBZ. A look at

the surveillance scan shows a large MCS to the ENE/NE/NNE, heading this way. AJN

0600 UTC: Cells to the SE are gradually decreasing in number and intensity. There have been a couple new cells to develop over the past hour. The sustained cells and new development has mainly occurred to the S of NPOL between 50-100 km. The surveillance scan is now picking up most of the large MCS cruising to the SW toward NPOL at around 60 km/hr. The leading edge is located at around 140 km from NPOL so it is just entering NAMMA\_FAR\_S. It looks to be upwards of 200 km along the line and around 15-20 km deep across just the convective line at the center of the bow. It appears to be a mature MCS with a fully developed convective line and hints of the trailing stratiform area on the surveillance scan as well. Surveillance scan shows maximum reflectivities of around 46 dBZ currently. This may explain some of the returns in the NW quadrant noted earlier. It actually was a lot of second trip. Wow. Should've worked the day shift. AJN

0645 UTC: MCS still holding together and on track for around a 0800 UTC arrival at NPOL. It does appear to be over 200 km along the line. AJN

0700 UTC: Day shift relieved the night shift. AJN

0705 UTC: NW/SE oriented MCS propagating SW. Leading line looks as though it will bow. Portions of the leading line with reflectivity >50 dBZ. There are also a few cells out over the ocean and another cell that has initiated at the mouth of the Gambia River. AER

0720 UTC: The cells over the ocean have grown significantly in size in the last 15 minutes and are highly sheared. AMMA35, AMMA36, AMMA37, and AMMA39 rain gauges are currently encountering the leading line. Velocities are also folding roughly along the 30° and 80° azimuths for the 0.5° elevation scan. The anvil associated with the MCS is clearly visible to our NE. AER

0730 UTC: The intensity in the leading convective line has declined somewhat and there are gaps in the reflectivity in the stratiform region although the system as a whole still looks healthy. Another line is building along the SE flank of the MCS at 193 km range and 105.3° azimuth. AER

0745 UTC: Large trailing stratiform rain region. The leading line (particularly the NW portion) has surged ahead leaving a characteristic reflectivity minimum (or complete lack of precipitation in some cases) between the leading line and the stratiform region. AER



0801 UTC: The leading line is increasing in length to the NW over the ocean. AER

0804 UTC: Gust front passed. AER

0805 UTC: Rain started – sounds like large drops of rain falling on the roof. AER

0816 UTC: Leading convective line just passed over the dense rain gauge network. AER

0830 UTC: Leading line has “stretched” out (long and thin). The leading line is just passing over Kaolack. Interestingly, there is a large hole in the precipitation field behind Kaolack where the stratiform rain region should be. There are a few cells out over the ocean just ahead of the leading line that will likely feed into it. AER

0849 UTC: The leading line has returned to being strictly linear (281.5°-174.7° azimuth). The NW portion of the line is now lagging behind. At 4.5° elevation it looks as if there are 2 separate but parallel convective lines. There is a slight reflectivity max (37.5 dBZ) in trailing stratiform region at 140 km range and 45° azimuth. As the squall line passed, there was light rain behind the convective line but it was very windy outside. Gusts were up to 46 mph outside which was enough for the flux tower team to lose their tethered sonde balloon. AER

0900 UTC: MCS reflectivity intensities have increased again. AER

0947 UTC: The reflectivity max in the stratiform region has moved farther N. AER

0959 UTC: No rain at the radar site, but it is windy outside. AER

1030 UTC: The system seems to have turned more to the S. The leading line is also breaking apart at 180° azimuth and the stratiform rain region is now falling apart. AER

1110 UTC: Although it appeared that we would get more stratiform precipitation here at the radar site, we have not seen any additional rain. There are dark clouds in the sky and the temperature is considerably cooler due to the cold pool outflow. AER

1113 UTC: I felt a few drops of rain outside (maybe I spoke to soon in the above note). AER

1128 UTC: After looking back at loops of the Surveillance scans, it appears that the MCS seemed to weaken around 0815 UTC which was also when the line crossed the radar. However, the entire leading line showed decreased reflectivity which brings up the question of whether this is related to a wet antenna problem or just because the system was in close proximity to the radar.  $\rho_{hv}$  didn't decrease too much, although lower than ideal, especially through the convective portion of the line at 0815 UTC. AER

1300 UTC: Stratiform rain out past 150 km for the most part now at 225° azimuth. AER

1635 UTC: We noticed that the radar had stopped radiating for about a minute, but it started back up. (may have arched – this is not the first time that this has happened during the NAMMA project) AER

1730 UTC: Clear except for sidelobes from Dakar. AER

1905 UTC: Night shift relieved day shift. AJN

1945 UTC: Looks like a quiet night, clear skies overhead and NPOL showing little to nothing. It looks like there is some second trip echo to the SSE at around 100 km on NAMMA\_FAR\_S. Surveillance scan shows some convection along those radials at around 250-270 km, right where it should be. AJN

2100 UTC: Severe clear over NPOL and most of the scan area. There is still some precipitation echo showing up over 200 km away towards the SSE, creating second trip echo on the main scan. There is a decent amount of AP tonight, although Dakar isn't showing up very strongly at the present time. AJN

2200 UTC: Clear over NPOL. Precipitation well to the S/SSE is still ongoing. It doesn't appear to be moving very fast and seems to be weakening over the past 15 minutes. It is still over 210 km away from NPOL and moving slowly to the NW. AJN

2300 UTC: Still clear over the NAMMA\_FAR\_S domain except for the AP and second trip from the precipitation still hanging SSW/S/SSE of NPOL at over 200 km in range. Oh yeah, and one lone little cell has developed at an azimuth of 210° and a range of 55 km. Maximum core reflectivity seems to be around 48-49 dBZ with echo tops around 7-8 km. AJN

01 September 2006:

0000 UTC: Welcome everyone, to September. May September treat everyone better than August did. The lone cell continues. It is moving to

the SW almost along the 210° radial. It has slid only just west of it over the past hour and about 30 km out in range. Precipitation way to the south continues. AJN

0100 UTC: Clear in the area. AP and second trip continue. Precipitation seems to be scared of the 200 km range ring tonight. The lone cell has pretty much dissipated. There is only a small little blob of weak echo left. AJN

0200 UTC: Clear in the immediate area. Most everything is unchanged from the past hour. The loner cell is gone now. The convection to the SSE of the radar has made a push inside 200 km and is now as close as 180 km. AJN

0330 UTC: NPOL quit radiating at the 0300 UTC scan but I was working with some NPOL data and didn't catch it until now. Thankfully there is nothing to miss. A quick surveillance scan to get things fired up again shows some weak echo to the SSE at around 155-200 km and that's about it. There is a small lone cell again over the ocean, AZ: 240, RNG: 105 km. AJN

0500 UTC: Not much out there, even on the surveillance scan. There are two areas of scattered cellular convection, one area is to the WSW starting at about 140 km away and the other is SSW starting at around 240 km away. The WSW area has the more intense (reflectivities as high as 52 dBZ) /cells but they are small and there are only about 6-8 cells total. AJN

0600 UTC: Severe clear. We made it through a night with only one glitch in NPOL. No precipitation echo inside of 140 km. The echo that is, is a lone cell to the SSW right at 140 km. This is about it for precipitation returns. There is still a good amount of AP. AJN

0716 UTC: There are a few cells out past 150 km range over the ocean (SW of radar). AER

0900 UTC: Still clear. There is supposed to be a DC 8 flight mission today but what they will investigate in terms of precipitation remains to be seen. I am going to call them now and will update the log once I have a better idea of what the plan is. AER

0912 UTC: Unable to get in contact with Cape Verde Project Office so I called Everette Joseph and left a message asking for an update. AER

1015 UTC: We called the Project Office before 1000 UTC and they said that they would fly at 1300 UTC. However, Everette stopped by and said that the scientists at Cape Verde were meeting now and would likely fly although

the decision would be final somewhere around noon. It remains clear on the radar although humidity has increased and cumulus clouds have popped up covering a large portion of the sky. They appear to be highly sheared. This may suggest why the DC 8 crew is planning to fly later this afternoon when (or if) convection breaks out. AER

1138 UTC: Still severe clear. AER

1201 UTC: Sidelobes from Dakar showing up on Surveillance scan. Otherwise clear except for a single small cell that has popped up over the ocean. AER

1300 UTC: Cells starting to develop in southernmost (below Gambia) Senegal. AER

1303 UTC: There appears to be some kind of convergence on land just onshore over the coastal regions. It is particularly apparent S of the radar out to 40 km in range on the 0.7° elevation scan. AER

1549 UTC: Cumulus building outside. AER

1601 UTC: Besides large sidelobes from Dakar, the Surveillance scan shows everything clear around here although there is a line of cells just coming into range at 147 nm and 170° azimuth. AER

1652 UTC: Cumulus clouds continue to build around the radar site although radar display remains clear. AER

1715 UTC: Radar stopped transmitting for a minute but reset and continued to work without a problem (NO volume scan for 1715 UTC). AER

1727 UTC: Wind shifted to the NW (onshore) although winds remain light (2 to 3 mph). AER

1730 UTC: Cells have popped up around the mouth of the Gambia River. The small line of precipitation (from cells mentioned at 1300 UTC) continues to move NNW. AER

1730 UTC: Ck'd generator fuel level. Shows half full. PLH

1820 UTC: I called the Project Office. They are flying and wanted to coordinate with the radar but they called Paul Kucera's number and he is back in the States. I told them that we had our radio frequency on all day but that we didn't hear anything from them. They have a phone list but don't know who is working shifts. I told them that John Gerlach and Paul Le Hardy would be working tomorrow because they might fly another mission.

There really needs to be a better system of communication set up. This is the end of my rant for the moment. AER

1845 UTC: Line of precipitation starting to show some organization off of the coast of Gambia. A maximum reflectivity value of 50.8 dBZ occurred at 136.5 km range and 175.5° azimuth. AER

1900 UTC: Night shift relieved day shift. It's a clear night over NPOL. Some precipitation echo, a multicell cluster is present from AZ: 150-195 outside of 100 km through 150 km. Maximum reflectivities are around 50 dBZ in a few locales. 20 dBZ contour heights are near 16 km and 40 dBZ contour heights are around 7.5-8 km in the most intense core. Movement is to the NW at around 25-30 km/hr. AJN

2000 UTC: Convective cluster looks more like two small line segments now. The leading one is around 95 km due S of NPOL to around 140 km SSW of NPOL. The second smaller line segment is around 95 km at 160° to about 120 km at 175°. Leading segment appears more intense and has 20 dBZ contour heights as high as 18 km. Movement is still to the NW at around the same speed. AJN

2100 UTC: Convective cluster has weakened somewhat. The areal coverage has decreased as well as the 20-dBZ contour heights (down to around 14 km). Maximum reflectivities are still 50 dBZ in the western segment. Some scattered convection has developed to the SE and S of NPOL (one cell appears to be very near Saly). Everything is still moving to the NW at around 20-30 km/hr. There are hints of another large MCS on the surveillance scan due E of NPOL outside of 250 km. AJN

2200 UTC: It is sprinkling at NPOL and the moon is out, neat. There has been a decaying cell moving toward us over the past half hour and it has arrived. It will only rain briefly and not very hard. The echo to the SW has dissipated. An area of stratiform precipitation is all that is left. This is outside of 110 km to the SE. Some scattered cells located to the ESE/E of NPOL, 50-100 km away, continue to move NW. There is a system to the E of NPOL, with the leading edge about 175 km away, moving almost due W or just south of W at around 60 km/hr. It isn't as large as the system on the 31 August, but it looks to be as intense or even more so. AJN

2300 UTC: Most of the stratiform area to the SW has either dissipated or moved out of range. There is a good bit of AP again tonight and some indication of the side lobe ring from Dakar. The big news for the night is the MCS heading for NPOL. It looks like it will be another direct hit. It seems to be moving due W at around 60 km/hr. Maximum reflectivities are around 50 dBZ along most of the line (54 dBZ lofted core in one locale). 20 dBZ echo heights are up to 18 km (15-18 along the line generally) along the

northern 2/3 of the system, but only around 9 km in the southern 1/3 of the line. AJN

2330 UTC: Lightning in the distance to the East. Some of the bigger discharges light up most of the leading towers. Looks pretty impressive. AJN

02 September 2006:

0000 UTC: A north to south oriented MCS continues to move west towards NPOL. Current speed estimate is still right around 60 km/hr. The leading edge is currently about 60 km away, so it should arrive right around 0100 UTC. It is an impressive looking system. The convective line is very nearly continuous with reflectivities no lower than around 20-30 dBZ and maximum values of 50 dBZ. The stratiform region is nonexistent along the northern half of the line. The southern half has stratiform echo back through 250 km from NPOL, with the characteristic gap right behind the line indicating strong rear inflow. 20 dBZ contour heights are still split, now more along the northern half and southern half. Northern half tops are around 12-16 km with the southern half coming in with 20 dBZ heights as high as 12 km but more typically 8-9.5 km. Note: NPOL stopped radiating on the 0015 scan but captured all but the highest (above 14-15 km) portions of the system. NPOL re-started fine for the 0030 UTC scan. AJN

0030 UTC: MCS is still on track and holding together. It is about half an hour away right now and the lightning is starting to light up the sky and ground. I've found lofted reflectivities as high as 54-56 dBZ and base elevation reflectivities of around the same. It is pretty obvious that the northern half of the line is more vigorous. The presentation in the reflectivity field is really starting to show that well along with the disparity in 20 dBZ echo tops. The entire gauge network will get rain tonight. AJN

0045 UTC: There appears to be a small bowing segment just south of Saly. This portion of the line has moved slightly ahead of the rest. The line appears to be around 250 km long. AJN

0102 UTC: Getting some gusts and some sprinkles. Its almost here. AJN

0107 UTC: Starting to rain hard. Wet antenna issues should be kicking in momentarily. AJN

0112 UTC: Raining very hard. Gusty winds up to 30 mph, sustained 20-25 mph. AJN

0130 UTC: Light rain here at NPOL as line has already passed. It seems that the line was in the process of changing into a broken line as it passed

over NPOL. This would seem to indicate overall weakening too me, and thus it might explain the wimpy winds. The southern and northern ends have maintained good vigor with 20 dBZ heights of 12-15 km and maximum reflectivities of 43-46 dBZ. AJN

0200 UTC: Stratiform rain region is over the area. The MCS has become more of a broken line with a large hole to the NW and another large gap to the SW. The center portion of the line experienced some regeneration over the past half hour with new cells developing over Dakar. Most of the areas of stronger convection are associated with 20 dBZ tops over 14 km right now. All but the extreme southeast portion of the convective line has pushed off the coast now. AJN

0230 UTC: Loud thunder from a couple huge CG strikes. From the 5-second rule, they were about 2 miles away. AJN

0300 UTC: Stratiform rain region is still solidly overhead with occasional lightning. MCS continues to push west. It is moving past the 100 km range ring. It has become a broken line right along the 110-130 km range rings right now. It actually makes a half circle along the 100 km range ring with the stratiform region in the middle extending east out of the semicircle. I can find no signs of any mesoscale vortex associated with this system. AJN

0329 UTC: Since this stratiform region is very uniform I am going to run a birdbath scan now and maybe one in another half hour or hour. We have a great bright band showing up with the classic enhanced reflectivity circle around the radar at higher elevation angles. Cross sections also show a very nice bright band at around 4-4.3 km, putting the freezing level at approximately 4.5-4.8 km tonight. AJN

0430 UTC: The convective line has departed the NAMMA\_FAR\_S domain and has left a large stratiform area of precipitation over around 2/3 of the western semicircle of the domain. There are also weak returns ( $< 10$  dBZ) over much of the NE quadrant inside of 100 km. This system has left an extensive cloud deck ( $> 7500$  km<sup>2</sup> probably) that is slowly precipitating out over western Senegal. This data could be huge for surmising heating profiles from these types of systems. Too bad I don't do model/tropical work. AJN

0600 UTC: Most of the stratiform echo has moved/precipitated out. Not much left in the scan area. AJN

0615 UTC: NPOL or IRIS hung or something went goofy on the 0615 scan cycle. Re-started. AJN

0630 UTC: NPOL is scanning again. AJN

0745 UTC Ck'd generator fuel level. Top of red float, at bottom of half full mark. (Just below half full). PLH

0905 UTC Fuel truck showed up at front gate. Showed the driver where he needed to go with the tanker, and after walking the back access road, he determined that the truck could get stuck due to soft ground and water puddles. Fuel can not delivered today. PLH

1206 UTC Radar quit radiating for a few minutes. Outside looking for some tools for the UVA group. Reset at 1217. Looks OK.

1433 UTC Light rain starts at the radar. A squall line formed to the north east but had broken into multiple cells. Since the leading edge was about 5 km to the NE. Switched to NEAR STAR mode which started at 1415. JCG

1516 UTC Moderate rain at the site.

1615 UTC System has passed the radar but a line of shower has stalled out along the 120 AZ radial. Light rain continues at the radar. Cloud tops of nearest cell not very high so switched back to FAR scan.

1630 UTC Line along the 125 AZ persists.

1700 UTC There is development at the SW end of the line with cells forming to the north giving changing the line into a hook shape. JCG

2000 UTC: Night crew has relieved the day crew. We are now working 0800-2000 and 2000-0800 UTC shifts. AER

2149 UTC: There is a broken line of small although relatively deep (several with tops above 15 km) cells that was previously moving northward is now dissolving. AER

2200 UTC: We are supposed to update the radiosonde team if anything looks interesting for a 0000 UTC launch. Nothing of much interest on the radar at this point although I will check in an hour and update them regardless. AER

2300 UTC: Anything of interest is dying out. I radioed to the radiosonde team that the only thing of interest to view with a sonde would be the dry air aloft, i.e. they won't be sending up a radiosonde at 0000 UTC. AER

2331 UTC: There is precipitation out beyond 250 km over Gambia at 110° azimuth. AER



03 September 2006:

0045 UTC: Range folding occurring from 10 to 40 km range and 180° to 270° azimuth. AER

0125 UTC: Transmitter stopped radiating. AER

0147 UTC: I turned the radiate button back on and everything appears to be running OK now. The 0115 and 0145 UTC volume scans are incomplete and the 0130 UTC volume scan is entirely missing. AER

0200 UTC: Cells to our NE are beginning to form at 60 to 150 km in range and from 325° to 340° azimuth. AER

0215 UTC: The line of cells to our NE mentioned above is now filling in. AER

0230 UTC: There are new cells popping up further ENE at 100 km range and 320.0° azimuth. AER

0246 UTC: The cells at 60-150 km range and 325°-340° azimuth now weakening somewhat. AER

0302 UTC: Sidelobes from Dakar still apparent at 2.3° elevation scan. AER

0331 UTC: Cells to our ENE (270°-300° azimuth) now strengthening and showing max reflectivity values of 36.2 dBZ although they are still only single cells showing no organization. AER

0400 UTC: Two cells have popped up in the ESE sector: one at 95 km range/250° azimuth (stronger of the 2) and one at 135 km range/260° azimuth. The strongest cell from the 0400 UTC elevation scan is located at 165.7 km/291.3° azimuth. AER

0500 UTC: 3 cells of note out over the ocean, although nothing organized:

109.5 km/340.5°	max reflectivity: 42.8 dBZ
182.1 km/281.8°	max reflectivity: 42.8 dBZ
166.8 km/293.1°	max reflectivity: 40.2 dBZ

0531 UTC: Cell at 109.5 km/340.5° is growing in intensity and size

0600 UTC: 2 cells to note:

219.7 km/262.3°	max reflectivity: 40.2 dBZ
271.1 km/266.1°	max reflectivity: 42.8 dBZ

The cell at 109.5km/340.5° is growing in size although small, unconnected areas of max reflectivity reach only about 5 km altitude in height. AER

0700 UTC: The cell at 109.5km/340.5° has diminished in size. Outside observations show large coverage of shallow clouds with cirrus deck above. AER

1045 UTC: John Gerlach found out that the Cat-Cat had gotten stuck on the way to the gauges. He decided to go to organize getting them out. He took the GPS and I called Paul LeHardy at the hotel and he is going to wait for John to pick him up in the lobby. John might need his language expertise. PGB

1710 UTC: At approx. 1600 hours, Everett brought the car to the North end of the generator trailer. I brought out the electric pump and with the help of the guard and one the local boys, pumped two barrels into the tank. One drum was only about  $\frac{3}{4}$  full and assuming they hold 55 gallons, I estimate that maybe between 80 to 90 gallons went in. The gauge is floating at just above the half mark and I estimate the tank to be about  $\frac{1}{4}$  full now. No other problems have occurred to this time. Everett told me that the fuel tanker was stuck on the gravel road to the north of our site, and has been there since 0900 hours this morning. They are working on trying to get it out. I have not seen it myself. PGB

2030 UTC: Night crew has finally arrived to replace the day crew. There was a mix up with the cars but everything seems to be straightened out now. AER

2115 UTC: Similar to last night, there is a slight increase in reflectivity in the SW sector over the ocean out to 40 km range. It may be AP seeing as range folding doesn't seem to occur in the Surveillance scans due to the lower PRF and there doesn't appear to be any precipitation that could be range folded into the radar. There is one relatively large cell with low reflectivity values off the coast at 115 km range and 16.7° azimuth. AER

2215 UTC: Large side lobes from Dakar. There are a few cells offshore of Saint-Louis although low reflectivities are associated with them. AER

2300 UTC: There are multiple cells from 353.7° to 27.0° azimuth and 50 to 150 km in range with max reflectivity around 25 dBZ. They are unorganized and moving offshore. AER

2325 UTC: Two high reflectivity cells at 19.8° elevation scan only 10 to 15 km from the radar site. (These later turned out to be nothing and we received no rain at the radar at all last night.) AER

2333 UTC: Precipitation not impressive at 0.5° elevation scan but at 1.8° elevation, there is clearly more elevated precipitation. AER  
2339 UTC: Message #125: Scan stopped after 21 seconds of unusable data. As soon as I turned NAMMA-FAR-S off, the transmitter quit. AER  
2340 UTC: I turned the transmitter radiate button back on and scheduled Surveillance and NAMMA-FAR-S scans to start again at 2345 UTC. AER  
2345 UTC: Radar scanning fine now. (The 2330 volume is incomplete.) There are possible sidelobes from precipitation to our N occurring at approximately 60° and 120°. AER

04 September 2006:

0000 UTC: Small convection continues to the N, but nothing of any great interest. AER  
0100 UTC: There are small unorganized cells from 300° to 0° azimuth out to 200 km range. Sidelobes from this precipitation are still occurring between 100 and 150 km from 60° to 120° azimuth. AER  
0200 UTC: Still getting sidelobes from precipitation as well as Dakar. Precipitation is starting to become further organized as it moves offshore with max reflectivities increasing to 36.2 dBZ (at 169.3 km range/346.5° azimuth). The line is moving ENE at slightly less than 20 km/hr. AER  
0211 UTC: Checked generator. Temperature reads 180°F exactly. AER  
0400 UTC: Line starting to become more organized. AER  
0500 UTC: Line continues to move ENE. The northernmost part of the line has broken off while the southernmost part of the line is very thin with little development of precipitation. AER  
0600 UTC: Cell at 178.4 km and 316.7° increasing in strength (max reflectivity 42.8 dBZ) as part of the line of precipitation. AER  
0700 UTC: The line in the 150 to 250 km range and 300° to 330° azimuth sector has weakened considerably, breaking apart into 3 separate cells. AER  
0745 UTC: Any remaining precipitation from the weakened line has now virtually all dissolved. AER  
0800 UTC Scattered clouds no precipitation within the radar range.  
0900 UTC Widely scattered very small shallow echoes. Fair weather Q.

1200 UTC increasing number of small echoes some merging but tops below the freezing level. JCG

1500 UTC More of the same. Mike W. set up another light. We worked on the entrance trying to reduce the trip hazards. Radar seems to run fine. Mike monitoring the antenna parameters for indications of slip ring problems. No sign of the fuel truck.

15:46:08 UTC A SUNTRACK\_HV scan was run. Antenna gain calculates to be 40.51 dB.

15:48:57 UTC Back on schedule. IRIS terminated the SURVEILLANCE scans because the antenna was left on the sun after the solar cal.

17:11:46 UTC The SURVEILLANCE scans are now back on schedule along with the NAMMA\_FAR-S scans. Fortunately there was no weather present during this momentary lapse of reason.

2100 UTC: There are large sidelobes from Dakar and range folding occurring along the 150° azimuth, otherwise it is clear. Winds are from the NW at 5 mph. AER

2202 UTC: There is a lone cell with a max reflectivity of 37.5 dBZ at 260 km range and 151.6° azimuth. At this range, however, we can only see into the middle to upper levels of the storm. AER

2300 UTC: Cells in Guinea-Bissau are skirting the Surveillance scan at 265 km range. AER

05 September 2006:

0000 UTC: Similar to previous nights, again there is a cell that has begun to form at the mouth of the Gambia River. AER

0100 UTC: Range folded cell coming in along the 40° azimuth, otherwise disturbingly clear. AER

0245 UTC: There are 2 cells of note: one at 259.9 km range/33.4° azimuth and a stronger one (in terms of reflectivity) at 272.1 km range and 57.1° azimuth. AER

0322 UTC: Checked generator. It's running exactly at 180°F. AER

0400 UTC: There are 2 relatively unorganized cells at 224.3 km range/32.9° azimuth and 229.7 km range/58.0° azimuth. (The max reflectivity associated with the last cell mentioned is 45.5 dBZ.) AER

0500 UTC: Although the cells mentioned at the beginning of the previous hour appear to be real, they progress towards the radar following the same azimuth which leads me to deduce that these cells are actually range folded. AER

0600 UTC: The cell at 164 km range/55.4° azimuth is still likely range folded as it continues its path into the radar following the same azimuth, although it appears to go through realistic evolutions associated with shallow cumulus storms. AER

0615 UTC: A cell has originated along the Gambia River. AER

0700: The cell mentioned above, continues to propagate SW and increase in intensity (max reflectivity = 45.5 dBZ at 188.4 km range/154.7° azimuth) Also, radar ran fine all through the night. AER

0800: Checked diesel fuel level – 21” on the tape measure ~ 225 gallons. Fuel truck refused to deliver on Saturday, tried on Sunday but got stuck. We still have 3 – 50 gallon barrels as an emergency supply. I will check today will the fuel supplier since there was no rain yesterday and the ground has dried out. JCG

0830 UTC Two isolated cells 61 km away at 45 degrees and a 40 km line of echoes just off the north east coast. This system developed over land and move to the NE intensifying when it reached the ocean. Otherwise nothing of interest.

0915: Fuel truck arrived to deliver fuel. Tanker delivered 1000 Liters. Brought fuel level up to 478 gallons from 237 gallons by the tape measure. Fuel transfer occurred without problem. Finished up around 1000 hours. PB

1126: Transmitter dropped out. Pushed transmit button and restarted it. No problems. It appears that we have only lost the 26.5 el scan which would only have shown clutter anyway. PB

1130 UTC Nothing but unorganized widely scattered isolated small cell all fairly shallow. JCG

1200 UTC PB off on a guided hike to the ocean.

1400 UTC: Greg Jenkins called to report models show no wave until Thursday. He thinks there will be something sooner. Telephone line is in at the Bakery. Now the problem is to get it to the radar.

2100 UTC: Before the day shift left, we tried to restart trmm-linux4 as the screen had frozen. Trying to log in as operator was unsuccessful in bringing IRIS back up to operational mode. Next we tried logging in as root and then using the fsck command as written in Paul Kucera's notes. At the prompt which says that continuing may corrupt files, I told John Gerlach to press yes as Adam and I had asked Paul about this before during a reboot because it seemed that pressing "YES" might do something bad to the hard drive. However, this time it was not helpful in restarting the computer. Trmm-linux4 is currently shut off. AER

2205 UTC: There are 2 large clusters of cells in S Senegal crossing into Gambia. The max reflectivity associated with these cells is 48.5 dBZ. Range folding is occurring between 120° and 150° azimuth on the Real Time Display. AER

2304 UTC: Range folding occurring at the 136° azimuth on the 1.4° elevation scan. Cells to the S continue to move W towards the Atlantic. The convective line looks more disorganized than at last hour although a stratiform region is forming which suggests overall organization in the developing precipitation. AER

0000 UTC: We have what appears to be a convective line starting to form at 160° azimuth from 130 km to 250 km in range although its shape is curved along the coast. AER

0115 UTC: There is a short line of convective reflectivity with a long, thin trailing stratiform region in the sector covering 194° to 120° azimuth and 150 to 250 km in range. It also appears that some "smearing" of reflectivity values is occurring. AER

0200 UTC: The leading line is at 200° azimuth. Several small cells seem to pop up ahead of the leading line and help it to surge forward. In addition, there is a relative maximum in reflectivity in the trailing stratiform region. AER

0216 UTC: There is range folding occurring in the SSW sector out to approximately 110 km. We must be catching just the N section of a larger MCS to our S. AER

0301 UTC: NW to SE oriented convective line with single cell that has popped up NW of the line. MCS covers 161° to 212° azimuth and 190 to 280 km range. AER

0400 UTC: Surveillance scan shows system to our S is moving SW out over the ocean. The stratiform rain region has decreased in size (length) but still contains a local relative max in reflectivity (~ 35 dBZ). AER

0500 UTC: Possible rain at the site. After looking at the Surveillance scans fully zoomed in, it appears that there was a boundary that might have spawned a shallow, short-lived cell. AER

0700 UTC: We are only able to see the remaining stratiform region of the MCS that passed to our S at 195° to 210° azimuth and 210 to 270 km in range. That's all for me folks, I'm signing off and heading back to the States. AER

07:30 UTC: The high and low pressure dehydrators are both running at 2 % humidity. The high pressure dehydrator is running at 20 psi. The low pressure dehydrator is running at .3 psi. mw

1200 UTC Suppressed conditions continue. The sky is partially overcast with a shallow layer of cumulus and higher thin cirrus. Very few echoes on the radar. JCG

1400 UTC Amadou, Greg and reporter from France arrived on site, asked questions and took photos. JCG

1430 UTC There is strong evidence of a wave approaching from the east. There is a MCS about 200 km to the east. It is 40 KM wide and 50 KM deep. The reflectivity is over 45 dBZ. Closer (120 – 150 KM) are developing cells with the 120 degree to 150 degrees in AZ. JCG

1700 UTC An 80 Km long squall line is 40 km east of the radar.

1730 UTC The line broke into two cells and has stalled out one cell is at 50 km and the other is at 40 km. The peak intensity at the 0.7 degree scan is 48 dBZ.

1745 UTC Closest cell is at 25 km but dying rapidly.

1800 UTC Dr Fadel Kebe reports that the ZR relationship for this region of Senegal is  $386 \times 1.3$ . We had been using  $200 \times 1.6$  which is the value for mid latitude storms. I changed the values on the Live display but am not sure how to change it globally.

1830 UTC All the cells have died. JCG

1900 UTC Just noticed that H power meter reads 9.03 and V 9.68. I did not write down the values earlier but recalled that they were close to being equal. JCG

2005 UTC Reported for night duty. Briefed by JCG on day's events. NSW at this time and system operating normally. Steve and Marcia will be here, at times, with me tonight. They will launch sondes at 2200, 0200 and 0600 hrs. PLH

0015 UTC Ck'd generator's water temp and fuel level. Ops normal. NSW. PLH

0105 UTC (Approx) Radar not radiating. Reset.

0650 UTC Ck'd generator's water temp. Ops normal, NSW. PLH

0800 UTC Cells at 120 km 140 to 170 AZ peak reflectivity 43 dBZ. Make a burn barrel and burned our trash. PB cut all the weeds around the site with a weed whacker and made a path to the flux site.

0900 UTC Cells to the South have dissipated.

1000 UTC Only activity is to the south and mostly off shore. Greg claims models predict convection triggered by a wave should start tonight. Possible DC-8 flight tomorrow. JCG

1300 UTC: Scattered convection, mainly in the SE quadrant. No organization, mainly small cells. AJN

1400 UTC: Scattered convection in the SE quadrant has increased in intensity and areal coverage. Starting to see something moving in from the NE on the surveillance scan, causing second trip in NAMMA\_FAR\_S. AJN

1500 UTC: Convection in SE quadrant doing its thing. Pulse type low shear storms it seems. There is a convective line showing up around 200 km out in the NE quadrant moving to the SW/SSW. Not a huge line, only about 75-80 km along the line. AJN

1600 UTC: Scattered convection in SE quadrant still going... Convective line to the NE is now present on NAMMA\_FAR\_S with leading edge around 110 km away from NPOL, moving SSW at around 40-50 km/hr. This system appears less impressive than past MCSs to roll over the area. The convective line is broken and has a pulse type look to it. AJN



1700 UTC: Have a cell merger along the southern edge of the MCS moving in from the NE. A stationary cell has been swept up by the system. The northern edge of the line is much weaker right now, maximum reflectivities of 51 dBZ versus 54 dBZ in the cell merger area with much less coverage of high reflectivities. AJN

1730 UTC: Last completed NAMMA\_FAR\_S scan. AJN

17:40 UTC Starting to rain at the site.

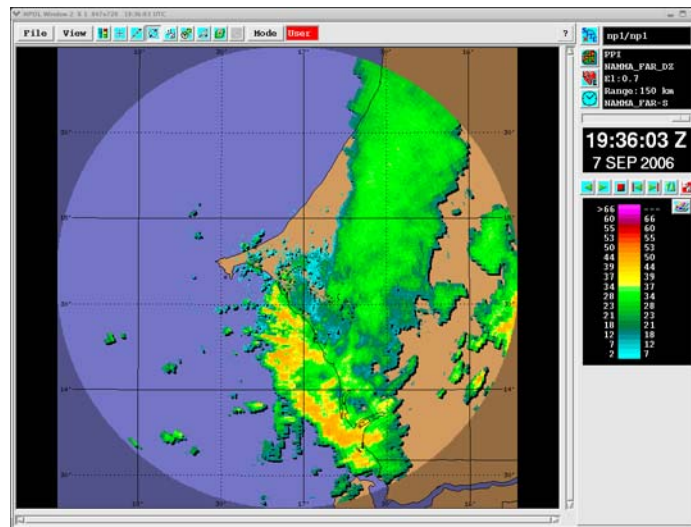
17:45 UTC Stopped the NAMMA\_FAR scan. Note: the scan was stopped prematurely by mistake.

17:56 UTC Started the NAMMA\_NEAR scan

1811 UTC: Second NAMMA\_NEAR\_S scan. Convective system seems to be struggling. The convective line is unimpressive. Stratiform region extends in a narrow band to the NNE of the system. AJN

1839 UTC: NAMMA\_FAR\_S restarted. AJN

1900 UTC: Convective line moving through NPOL. NPOL experienced a peak gust of 16 m/s, or around 37 mph. Heavy rain. The convective line now extends from around 25 km NW of NPOL through 140 km SSE of NPOL. It seems to be getting its act together, or we are in the middle of a fairly strong pulse. From earlier observations, I'll take the latter. In fact, upon closer inspection it seems that the size is an artifact of many individual cells merging into a line for a brief time. AJN



2000 UTC: Night shift relieved day shift. Issue with NPOL elevation control has caused several scans to be started at odd times/not completed.

See above for those issues. Convective line located along a line from about 151 km at 161° through 64 km at 208° with maximum reflectivities of around 51 dBZ in the most intense portion of the cell (near 198°). Stratiform precipitation area extends NNE about 240 km. Secondary smaller convective line/large cell located around 123 km at 109° through 163 km at 105° with trailing stratiform precipitation extending NNE around 75 km. Movement of larger system is to SSW, with secondary system moving to the SW very slowly, maybe 10 km an hour. AJN

2100 UTC: Secondary convective system seems to be dying. Larger system is pushing SSW still off the coast. Two main areas of convection are present, one along the west edge, and the other along the eastern end of the line with a weakness in the middle. The stratiform area still extends to the NNE over 200 km. System seems to be maintaining strength. AJN

2200 UTC: Convective system has mostly pushed out of the NAMMA\_FAR\_S viewing area to the SSW. The northern end of the line is around 120-130 km away and still moving SSW. There is some scattered convection to the NW of the main show. The secondary system noted earlier has died and left an area of stratiform rain to the E/ESE of NPOL outside of 110 km. The stratiform region behind the main show extends to the NNE around 100-130 km with a break, and then a weaker area covers much of the NE quadrant inside the 100 km range ring. AJN

2300 UTC: Scattered convection to the NW of the larger system has developed into a small cluster. The main system is almost completely outside of 150 km away from NPOL. The stratiform region in the NE quadrant has dissipated. The stratiform region from the secondary system (see above) is hanging tough, decreasing in size only slightly. Interestingly, it is moving W or WNW slowly, while the larger system and stratiform region continues to the SSW. This gives a hint that there may be some sort of larger circulation centered SE of NPOL. AJN

08 September 2006:

0000 UTC: The secondary stratiform region to the E of NPOL is dissipating (decreasing reflectivities and areal coverage). The main system continues to the SSW out of the NAMMA\_FAR\_S range. The convective cluster that formed over the last hour seems to be propagating to the WSW slowly. It doesn't seem to be generating a stratiform region yet. AJN

0100 UTC: Convection to the WSW of NPOL taking on more of a line shape. New development along 250-270° at about 60-80 km out is responsible for most of this. Movement is still to the WSW. AJN

0200 UTC: Convection to the SW of NPOL is sticking in more of a line form. Movement is now more SW, while the southern edge is moving more SSW. The stratiform region from the original MCS is decreasing in intensity fairly quickly over the past hour. This region seems to be moving NW. When looping the past hour of surveillance scans, one can see some sort of circulation in the system. AJN

0300 UTC: Convective line to the WSW is now outside of 100 km, moving WSW. Stratiform region is also departing viewing area by movement and dissipation. The circulation is not as noticeable on NAMMA\_FAR\_S. AJN

0400 UTC: Convection is building NE back along the northern edge of the line around 290-300° at a range of 30-50 km. This progression has occurred through the night now that I think about it. It reminds me of a banding feature one would note in a developing tropical system, because it may very well be. A circulation center still seems to be present. AJN

0500 UTC: Somewhat cyclonically curved band of convection continues in the NW quadrant down through the SW quadrant (on surveillance scans). Most intense convection is located in NW quadrant along a line from 270° at 130 km to the NE around 318° at 88 km. Movement is still to the WSW/SW. Stratiform region to the SW of NPOL, outside of 100 km, continues to indicate a circulation center somewhere in that area. AJN

0600 UTC: Convection to the W of NPOL seems to be moving almost due W right now. Stratiform area is almost all confined to outside of the 100 km range ring still with the E edge of it seemingly moving N or NNE. AJN

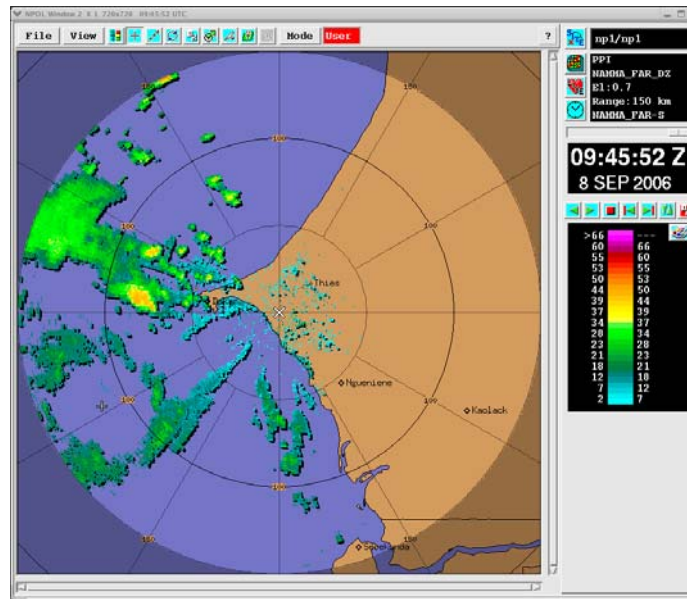
0700 UTC: Convective system to the W of NPOL continues to rotate westward slowly. Quasi-banding feature along the NW edge has become more diffuse. AJN

0800 UTC: System appears to be breaking up.

0900 UTC: Got the Satellite Internet connection working again. Paul LeHardy had removed the battery and reinstalled it and the Bogan terminal was able to lock onto a GPS signal. Paul Bashor discovered that the cable to the terminal was faulty.

0930 UTC: Called project office. Spoke to Gerry and Robbie. Possible flight over NPOL. TO time 1300 UTC will be in our area about 1400 UTC. Send gif of 0945 PPI showing some evident of circulation in system off shore.

1000 UTC System off shore continues to weaken and move to the west.



1115 UTC: Cells from the back side of the system form over Dakar.

1145 UTC: Cells remain stationary over Dakar and intensify producing heavy localized rain.

1200 UTC: Receive reports of flooding in Dakar. The rest of the system has moved to the west with only a hook shaped system at about 120 km away with max Z of about 39 dBZ.

1315 UTC: Convective system which has drenched Dakar finally drifts off shore. Reforming into a line of about 100 km running from the SSE to the NW with the nearest point about 20 km from land.

1345 UTC: Small intense cells form near the mouth of the Gambia river.

1430 UTC: Cells to the SSE grow forming parallel lines extending from the mouth of the Gambia River inland.

1545 UTC: Cells to the south merge forming a horse shoe shaped line running between the 100 and 200 km range rings.

1600 UTC: Sky is clear of echoes except for the horse shoe shaped line that has moved north. JCG

1615 UTC: Shell Oil rep visits the site to see why their fuel truck got stuck. Delivery of 1000 liters is scheduled for tomorrow. I ask him to bring the small truck and wait until Monday since we have about  $\frac{3}{4}$  a tank right now. Amadou calls later and says they can not deliver on Monday so want to come on Saturday.

1715 UTC: Strong cell 80 Km to the South West has diminished in size as it has approached. There are two small cells developing to the North of the radar along the North coast line.

1730 UTC: Cells to our south keep tracking to NNW towards the radar.

1822 UTC: Strongest part of the cell is 22 Km south of the radar with the leading edge on top of us. Highest dBZ is 36 dBZ,

1850 UTC: Systems continue to die with the daylight. Light rain starts at the radar. JCG

2000 UTC: Night shift relieved day shift. System to the SE has died. Seems to be all clear right now except for some clutter and light stratiform rain around NPOL and to the SE. AJN

2100 UTC: Appears we'll have a quiet night at NPOL. There isn't anything to note now except some AP. AJN

2230 UTC: NPOL had stopped radiating starting with the 2200 scan and through the first 2 elevation angles of the 2230 scan. Didn't catch it until now because I was working on some things. Thankfully it's a severe clear night. AJN

2330 UTC: Some scattered cellular convection has developed from around 260° through 310° between 50 and 100 km in range. AJN

09 September 2006:

0100 UTC: Scattered cells continue to be evident W of NPOL. They are moving WNW at around 25-30 km/hr. They are not very impressive looking. AJN

0200 UTC: Looking back there seems to be some sort of boundary that has been oscillating near or just off the coast in the area. Storms didn't really fire along it but it is something to note. Convection continues to move WNW. One larger cell is located along 290° at about 110 km. There is some second trip echo in the SE quadrant. Wonder what's coming... AJN

0300 UTC: The cells to the NW have formed a broken line right along the 301° radial. I think this is just a temporary alignment of several individual cells with slightly different motions, but we'll see. One lone cell about 210 km away is showing up along 105° radial. There seems to be something else behind this but it is right along the edge of the surveillance scan so it is hard to tell. AJN

0400 UTC: New convection seems to be firing along a boundary north of Dakar and keeping the small line to the NW. This seems to be a continuation of the boundary noted before. It looks like the sea breeze/land breeze front. AJN

0500 UTC: Convection to the E has died. Convective cells/broken line is a little bigger in coverage with some new development to the SE still. Other smaller cells in the SW quadrant. AJN

0600 UTC: We still have basically the same situation as the past 8 hours or so. Scattered convection to the W of NPOL moving NW. There doesn't seem to be any new development along the "line" in the NW quadrant now. AJN

0700 UTC: Convection in NW quadrant has moved beyond 150 km. The cells in the SW quadrant are now crossing the 270° radial and still moving NW, away from NPOL. No organization to any of this. AJN

1600 UTC Started to pick up elevation errors. Antenna not reaching requested elevation angle in time allowed. This was causing the scans to be delayed. We decided to take the antenna down and clean the slip rings.

1930 UTC After we finished we discovered that the hand wheel did not control elevation. The computer np1 had shut down for some unknown reason. After rebooting (a long process) we discovered that the computer did control elevation suggesting that the problem was not in pedestal.

2000 UTC Started scans. We forgot to turn on AZ drive so surveillance was late in starting. Did pick up same elevation error but the offset in requested and actual seems to improve with elevation angle. Reminder no data was taken from 1600 to 2000 UTC.

2000 UTC Night shift reported for duty. Briefed by JG and MW on the antenna elevation problem. Will monitor closely tonight. PLH

10 September 2006

0720 UTC Monitored antenna elevation and logged info for day shift. At 0528 antenna stopped rotating and radiating. This happened several times and the problem repeats itself at the same time intervals every hour. (It will start by itself after PRF change for Surveillance mode) PLH

0800 UTC: Day shift relieved night shift. Beginning to deal with antenna issues. AJN

08:54 UTC: Stopped scanning to investigate antenna AZ and EL issues.

1000 UTC: Antenna appears to be rotating around 2-2.3° faster than requested and around 0.4-0.7° lower than requested. Samples per bin are 120-128 with the faster antenna rotation, so that isn't a huge issue. IRIS is recording requested elevation information into data files, not actual, so that is an issue. Solution to problem is still unknown. AJN

12:30 UTC: Restarted schedule. The El offset was changed from -0.60 to 0.10. The permissible El error was changed from 0.50 to 0.61. The spare servo chassis was installed.

2000 UTC Changed permissible El error back to 0.5 from 0.61 and changed Elevation settling time from 1 second to 2 seconds. Performance improved! We did not fix the cause of the problem which is still unknown but treated some of the symptoms.

2010 UTC Night shift reports for duty. Briefed on system status. PLH

2220 UTC NSW and no major system failures. Radar goes into Surveillance without any delays. Antenna elevation still off (~.30) PLH

11 September 2006

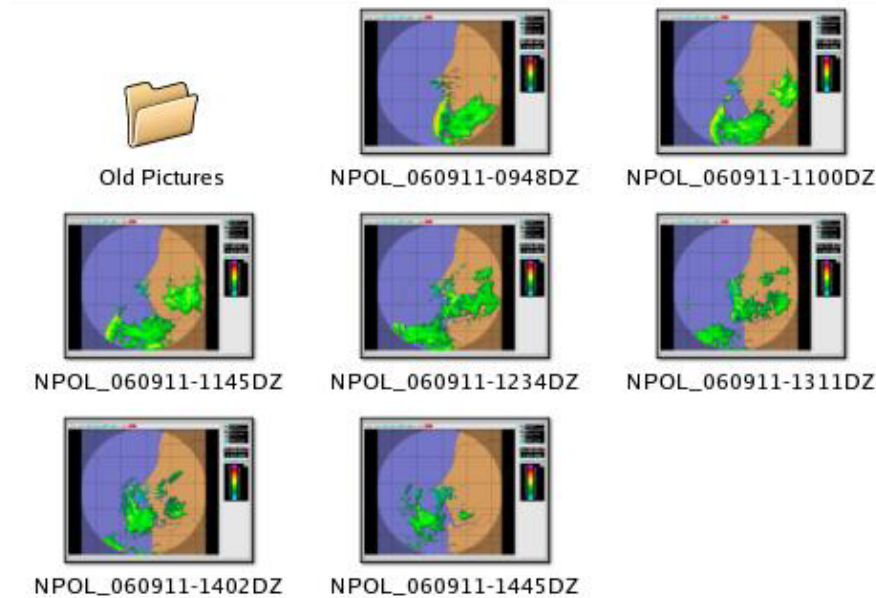
0645 UTC At approx 0200, the antenna stopped after the scheduled task and prior to going on surveillance. This was the only time this problem occurred but we continue to have multiple elevation errors. PLH

0800 UTC Large vortex is to the south of us we see evidence in the Surveillance scan of the precipitation spawned by the low pressure area. JCG

0900 UTC Squall line had slowly rotated CCW and is now off shore.

1100 UTC Wrote long email to Lester describing the antenna drive abnormalities. If I get reasonable Internet connection at the radar will attach a copy to this log. JCG

1200 UTC Additional cells associated with the vortex are approaching the radar from the ESE. They are still 100 Km away and appear to be circulating about the center of rotation. JCG



Summary of weather activity – radar is running well despite some issues with reaching the requested elevation angle. There was a brief shower at the radar at 1300. JCG

18:00 UTC The scans have been rescheduled after the EL issues have been resolved. Will monitor to see if this is true. The problem turned out to be a faulty RCP02 logic board.

The only changes that remain, due to diagnosing the El problem, are:

The EL settling time between sweeps was changed from 1 sec. to 2 sec.  
The EL offset was changed from .6° to .5°.

12 September 2006:

04:35 UTC Noticed radar stopped transmitting while NAMMA FAR-S task was running. Pushed transmit button and it restarted without problem. PGB.

0800 UTC Radar has no echoes within range. CNN satellite image this morning showed the clouds associated with this “vortex” is some distance off shore. Not clear if the low will trigger any convection within radar range today. DC-8 schedule to make microphysics flights over NPOL this afternoon!? jcg

1100 UTC: Stopped scans to do a solar calibration. Look angles were fine, elevation might be 0.2 degree off but with a 0.5 degree solar disk it is difficult to tell.



1130 UTC: Started scheduled scans again. There are only few echoes at 200 km to the south.

2000 UTC: Night shift relieved day shift. Had a shower on the drive in. Some scattered dying convection seems to be the culprit according to NPOL. There is lots of clutter tonight. Scanning speeds and elevation errors are doing much better after the fix the other day. AJN

2100 UTC: Some very shallow and weak showers are hanging on to the SE of NPOL around 20-30 km away. Echo tops are around 3.5-4 km so these are warm rain showers. It would be nice to get one over NPOL to see the DSDs on these, but they may not get here. AJN

2210 UTC: It is raining at NPOL! These are warm rain showers with a marine air mass influence I believe. Neat. Hopefully the RIS is working properly. AJN

2300 UTC: Showers have dissipated over land, still a few over the ocean, mainly to the W of NPOL. Not much south of NPOL. AJN

13 September 2006:

0100 UTC: Not much to report. Clear over NPOL. There are a few isolated small showers scattered around the scanning area moving N at around 20 km/hr. AJN

0300 UTC: Severe clear. AJN

0500 UTC: Still all clear, not even that much clutter tonight. AJN

0700 UTC: Sun coming up into mostly clear skies. Some cumulus and a few cirrus clouds. There are a couple stray showers around 65-75 km WNW of NPOL. AJN

0800 UTC: Day shift relieved night shift. A streak of showers is tried to develop just west of NPOL but is dying. There are other scattered showers developing/propagating over the ocean. AJN

0830 UTC Dark colored 55 gallon drum of Diesel Oil fuel, found open after rain fall. Fuel is contaminated with water. DO NOT USE IN OUR GENERATOR !!! PLH

0900 UTC: Just a few scattered showers around. AJN

1100 UTC: There have been popcorn showers going up and collapsing over the past 1-2 hours mainly just inland. Must be the sea breeze line kicking them up. AJN

1300 UTC: Scattered showers have mostly died out around NPOL. There is some new development in the NE quadrant around 75-110 km away. AJN

1500 UTC: Some scattered heavier convection has been ongoing in primarily E of NPOL outside of 100 km away for around 2 hours now. Looks like unorganized pulse type convection. AJN

15:30 UTC Stopped scans for computer maintenance.

16:30 UTC Restarted scheduled scans.

1700 UTC: Convection in NE quadrant has died, but is ongoing in SE quadrant. There is a larger system moving in from the NE, just starting to show up on the surveillance scans now. AJN.

1900 UTC: System continues to propagate SW toward NPOL. Northern section of system appears to be dying with new development on southern edge. System seems to be fairly unorganized. It is moving SW at around 40-45 km/hr. AJN

2000 UTC: Night shift relieved day shift. Convection along northern portion of system has collapsed for now. Convection along southern edge is still ongoing and still moving SW. Main show may end up south of NPOL, unless cold pool can regenerate convection further north. System is still over 110 km away. AJN

2100 UTC: Cold pool from convective system continues to propagate SE towards NPOL. Some new convection is firing along the leading edge. Convection to the E, or along southern edge is still the most intense and expanding in coverage. Quite the muddled display right now. Everything seems to be moving SW or SSW. One core ESE of NPOL (around 115o at 125 km) has 20 dBZ echo tops of around 16 km). Most of the convection along the established cold pool is low topped (around 8-9 km).

2200 UTC: Convection is slowly closing in on NPOL. Leading edge of the broken line is around 55-60 km away now. With the movement still around 40 km/hr, it should be here by 2330 UTC or so. The intensity of the section coming toward NPOL has increased a bit over the last hour, but it is still not that impressive. Maximum reflectivities are around 46-48 dBZ, but 20 dBZ tops are still only around 8-10 km. NPOL is picking up the leading anvil nicely right now around 9-10 km. AJN

2300 UTC: The line seems to be a bit better organized right now. The leading line has increased its higher reflectivity coverage. It should begin raining at NPOL in the next 10-15 minutes. Switched to NAMMA\_NEAR\_S for a while. AJN

2308 UTC: Raining at NPOL.

2315 UTC: Some wind with rain but not very impressive. Sustained 15-20, max 25 mph. AJN

2330 UTC: It is still raining at NPOL. The system is slowing passing over. It extends from around 20 km NW of Dakar, through NPOL then more SE through the 150 km range ring as a broken/almost solid line. Stratiform region seems to be becoming larger with time. AJN

14 September 2006:

0000 UTC: Main convective line has pushed off the coast, with the stratiform precipitation still to come. There is a new intense cell off the coast, about due south of NPOL. It has lofted reflectivities over 50 dBZ and 20 dBZ echo tops of 16 km or so. Stratiform rain is now over NPOL. AJN

0015 UTC: Switched back to NAMMA\_FAR\_S. AJN

0100 UTC: Convective line has filled in even more now. It is around 150-200 long ranging from 120 miles due W of NPOL following an arc to over 150 km due S of NPOL. The two ends are broken with the middle section being a continuous line. The maximum reflectivities are around 51 dBZ with > 45 dBZ fairly common in the middle portion of line. Stratiform region is holding together nicely behind the entire system. AJN

0200 UTC: Line becoming more broken again as it moves SW away from NPOL. Still have light rain at NPOL. Stratiform region has filled in even more behind system as it evolves. Line still seems fairly healthy with similar maximum reflectivities to last hour and some cores with 20 dBZ echo tops of 10-12 km. AJN

0258 UTC: Ran a birdbath scan. AJN

0300 UTC: Very light rain still at NPOL. Main stratiform region has pushed off the coast. Convective line is almost entirely outside of 150 km now. Only the middle portion of arcing line is still within NAMMA\_FAR\_S (around 120-130 km out now). The system is still moving to the SW. AJN

0400 UTC: The tail end of the stratiform precipitation still working its way over NPOL. It should be gone in the next hour. The convective line is out of the NAMMA\_FAR\_S viewing area now. The surveillance scan shows the line still moving SW at a range of around 200 km. The convection seems to have a weakening trend over the past half hour or so. AJN

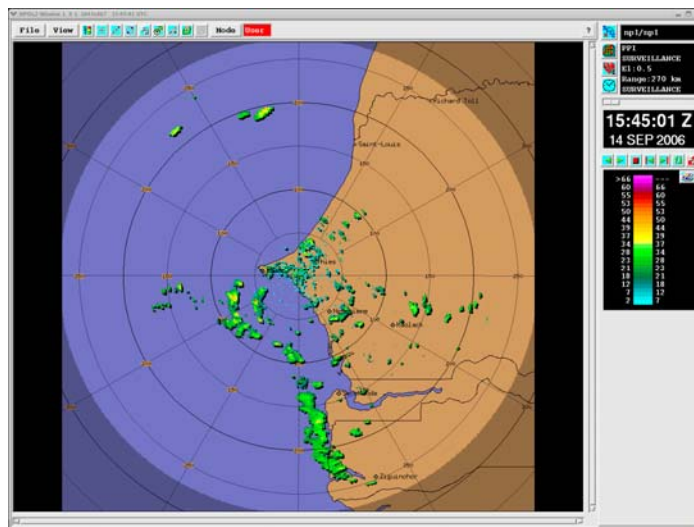
0500 UTC: The stratiform precipitation has finally departed NPOL. The cold pool seems to be generating some new convection outside of 220 km to the SW as it continues to move away to the SW. AJN

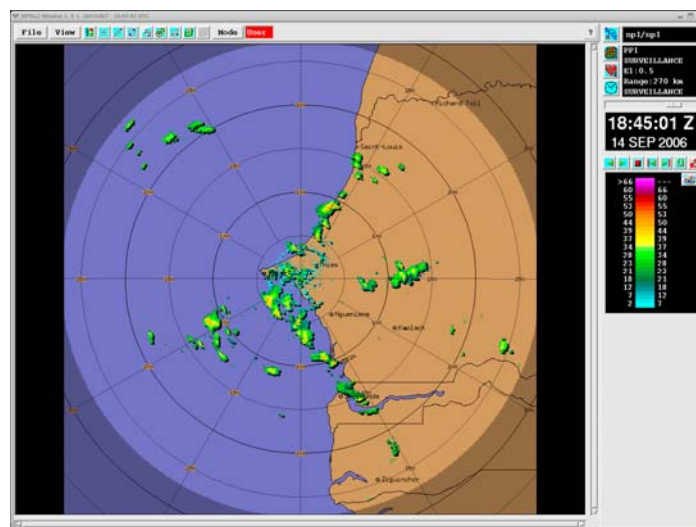
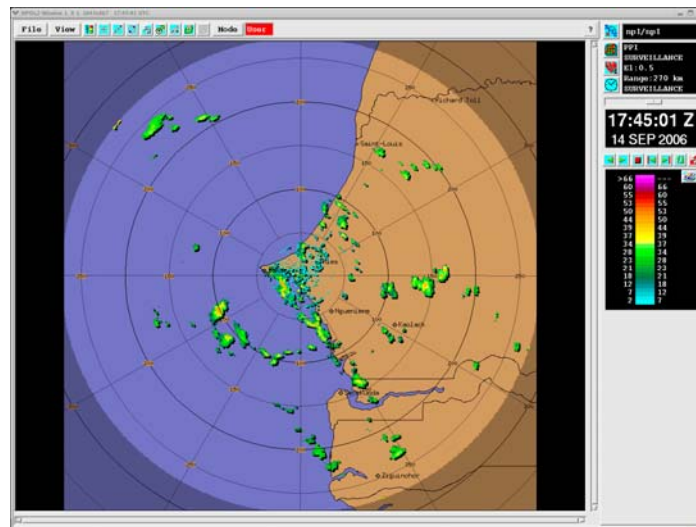
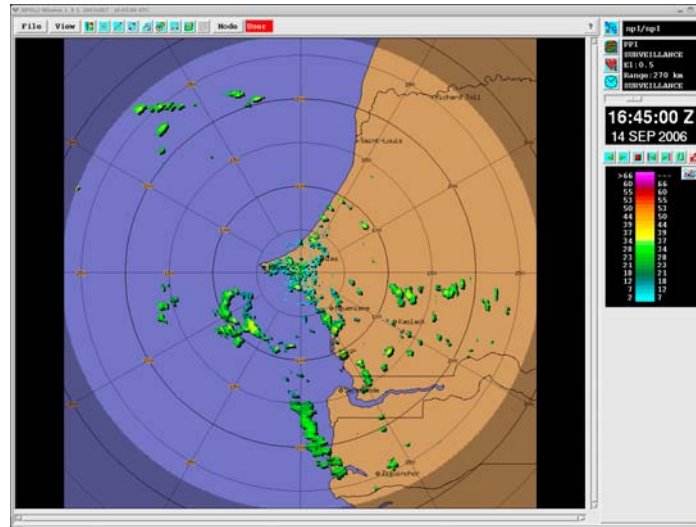
0600 UTC: Back edge of stratiform precipitation is now outside of 100 km range ring. Its clearing out at NPOL now (only a thin midlevel cloud deck left), and there isn't any other precipitation echo out there. AJN

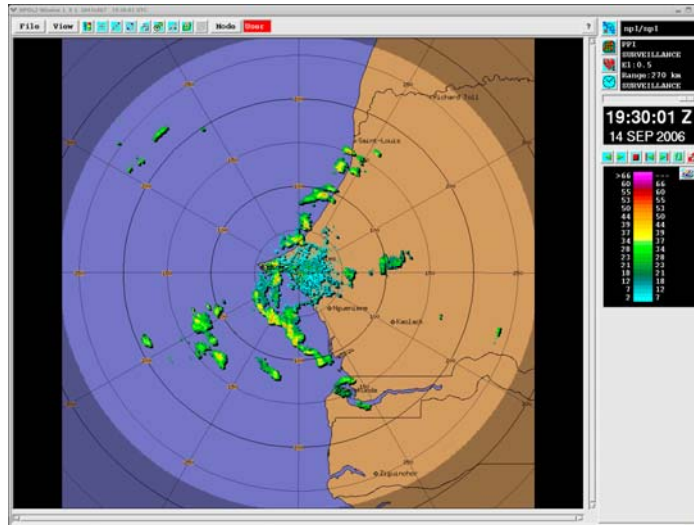
0700 UTC: The last of the stratiform precipitation is still hanging on outside of 100 km. Some scattered showers have begun to pop up over the ocean to the N of NPOL. They are sliding SW. AJN

0800 UTC: Day shift relieved night shift. AJN

0830 UTC: Paul LeHardy gives a telephone interview to the BBC for their Spanish language radio program. It was broadcast at 1000 UTC. Paul becomes an instant celebrity.







1930 UTC: Above a series of images from 1545 until now, 1930 UTC.  
AJN

2000 UTC: Night shift relieved day shift. Scattered cells have been moving WSW over the past hours. They are aligned in a V-shape with the leading point SW of NPOL with a bearing of  $233^{\circ}$  at 70 km. From that point scattered cells trail NE and SE. The NE point is located at a bearing of around  $17^{\circ}$  and a range of 165 km. The SE point is at a bearing of  $158^{\circ}$  and a range of 145 km. There are also a few cells ahead of this broken line and a few really small cells behind it coming toward NPOL from the E. AJN

2100 UTC: Neat little V-pattern continues to move just S of W (about due W along northern flank). A couple little showers have moved over NPOL in the last little bit. Larger cells continue in front of V-pattern. The 20 dBZ echo top in the point storm is around 14 km with the rest of the line (and leading cells) coming in at around 10-11 km. The showers over NPOL are 4-5 km or less (warm rain showers again). Maximum reflectivities are in the 43-48 dBZ range except the point cell, which has a few bins of 52 dBZ. AJN

2200 UTC: Convection is moving WNW along the northern edge and WSW along the southern flank. When looking at the surveillance scans over the past few hours it almost seems like there is a low-pressure center somewhere E of NPOL causing this movement. The convection itself is in a similar state as last hour. The V-shape is still composed of a broken line with the strongest convection being near the point of the V and there is no stratiform region to be seen. AJN

2300 UTC: Convection is building behind the broken line just SW of NPOL. Along the line, the northern flank has dissipated and it is now a line extending from just W of Dakar SW through 150 km SSE of NPOL. There

are also a few cells developing just NE of Dakar off the coast. Everything seems to be moving WSW except for the two cells left due N of NPOL about 100 km. These guys are moving WNW. You can kind of see the pivot point (i.e. low center) located just ENE (maybe) of Banjul International Airport in The Gambia. AJN

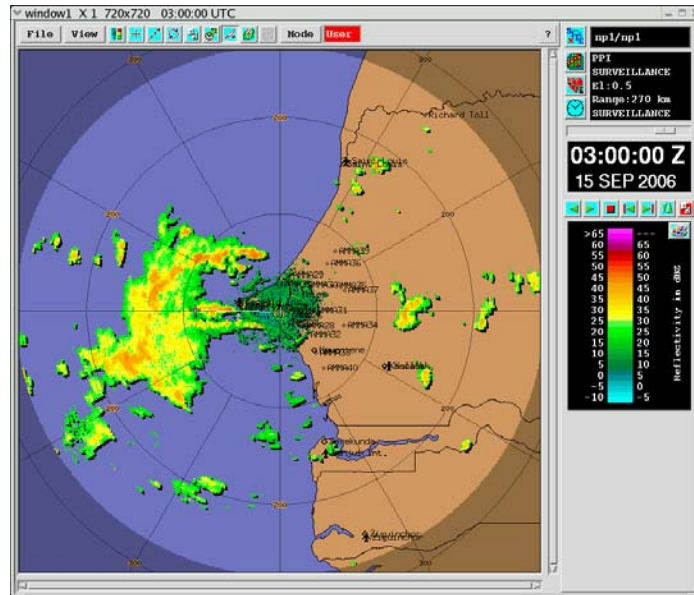
15 September 2006:

0000 UTC: Most of the convection is associated with the central portion of the now mostly defunct V. There has been continued development around 50 km away from NPOL to the NW and SW, resulting in a large area of convection on the western semicircle of the NAMMA\_FAR\_S viewing area. It consists of several clusters of cells with similar characteristics. 20 dBZ echo tops are running around 10-12 km in most of the main cores with maximum reflectivities of around 45-50 dBZ with isolated 52-53 dBZ areas. AJN

0100 UTC: Convection WNW of NPOL around 50-70 km continues to develop and is staying fairly intense. While the convection W/SW of NPOL continues to have 20 dBZ echo tops of 10-12 km, the convection to the WNW has developed some cores with 13-14 km 20 dBZ heights as well as having maximum reflectivities of > 50 dBZ. This convection is moving slowly NW. AJN

0200 UTC: Convection in the NW quadrant continues to be the most intense, although it is slightly less so than 0100 UTC using the 20 dBZ echo tops as an intensity metric. Those updrafts creating the high lofted reflectivities are starting to collapse as a time lapse of cross section shows descending cores of higher reflectivity. Some new development is still occurring along the back edge. Stratiform region is starting to show up more now. This could partially be a product of range from NPOL. AJN

0300 UTC: The new cores have reached maturity most likely with 20 dBZ echo tops around 15 km again in the convection about 80-90 km NW/NNW of NPOL. These storms continue to move slowly NW with backbuilding to blame for the slow movement. AJN

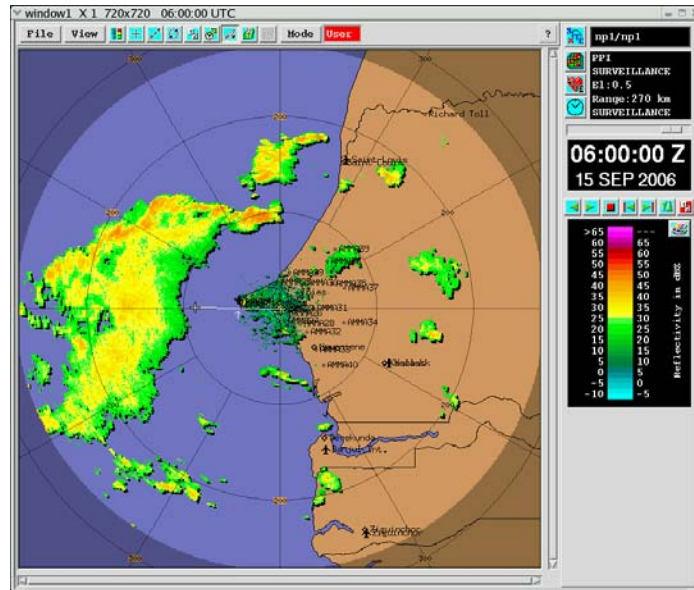


0400 UTC: Convection still going. One core at a bearing of  $318^\circ$  and a range of 90 km has 20 dBZ heights of 17 km. There is a lofted maximum reflectivity of 51 dBZ (around 3.8 km) with this core. Interestingly, ZDRs are only around 1.5-2.0 dB in this general area. Either the DSD is very narrow, there is a bit of small hail (or wet graupel) in there, or NPOL needs a ZDR adjustment again. RhoHV is low, around 0.93, but PhiDP (and therefore KDP) looks okay. There is a decent light show from these storms, but nothing like a good plains storm. AJN

0500 UTC: Most of the convection has moved outside of 150 km except for the line in the NW quadrant. This area of convection continues to have new development along the E edge as it all moves slowly NNW now. There is another cell due N of NPOL 135- >150 km that has developed over the past hour. This is moving to the NW at a greater speed. AJN

0600 UTC: Eastern edge of the line in the NW quadrant has finally made it to the 100 km range ring. This area is still developing cores that have 20 dBZ heights of 13-14 km and maximum reflectivities of up to 50 dBZ. The cell further north is almost completely outside of 150 km now, only about 10 km to go. The stratiform rain from the other convection to the W/WSW is all outside of 100 km as well. AJN



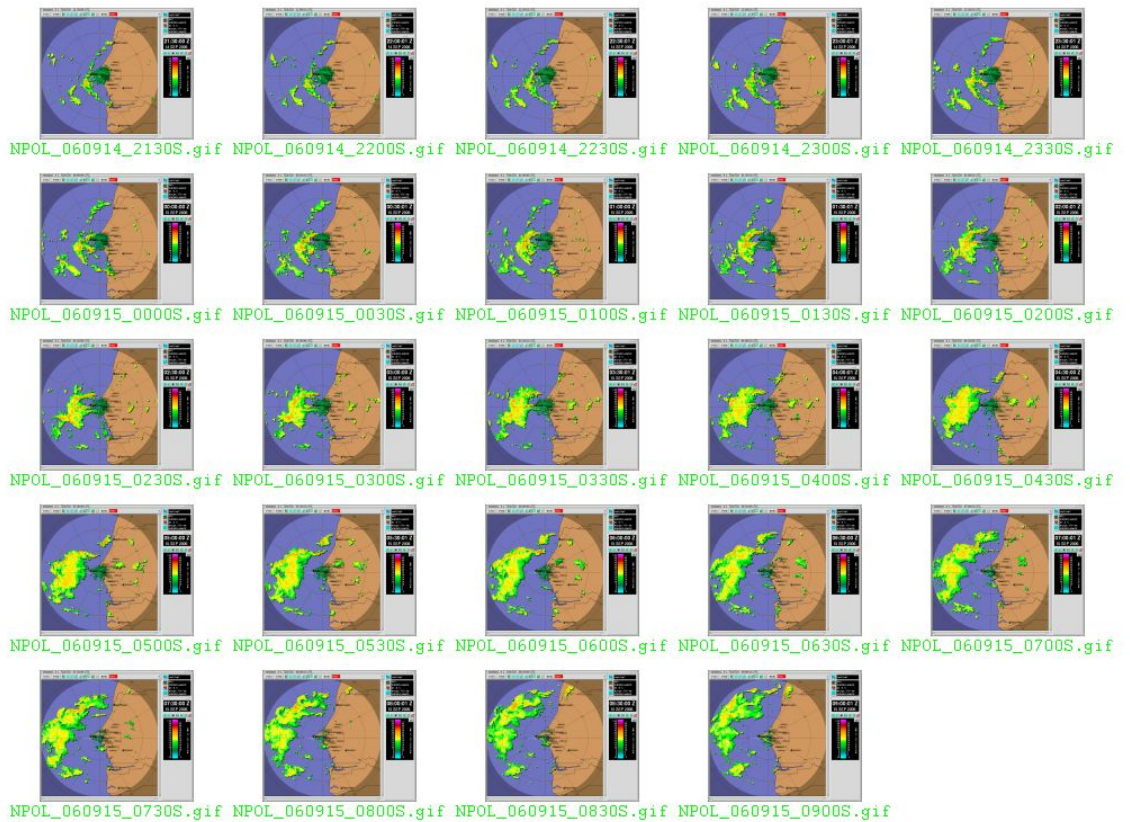


0700 UTC: The convection in the NW quadrant may finally be dying. The new development is weak and sparse, the most intense cell has falling 20 dBZ echo top heights and its movement has sped up considerably and is WNW suggesting that it has lost new updrafts along its E edge. AJN Other than this departing convection, there is still some stratiform precipitation to the NW/WWN moving W or WNW. A small group of showers SSW of NPOL around 55 km has developed and is moving around due N. AJN

0800 UTC: Day shift relieved Night shift. AJN

0900 UTC: Inserted below is a gif summary of the system that passed through yesterday. This sequence was made for Greg Jenkins so he could compare with the satellite imagery.

#### NPOL radar in Senegal



1100 UTC: Rain at the radar. Cell is small but produces moderate to heavy rain for a short period. (~10 minutes) JCG

1200 UTC: Another brief shower. Cells are moving as if circulating about a rotation center out to sea. The motion early this morning was to the NW now the cells seem to be moving to the NE. Models forecast the development of a vortex center. JCG

2305 UTC: Dehydrator stuck. I reset it and noticed that the radar had stopped radiating while NAMMA FAR-S was running. I reset it without problem. No other glitches to report. No significant weather to report. PGB

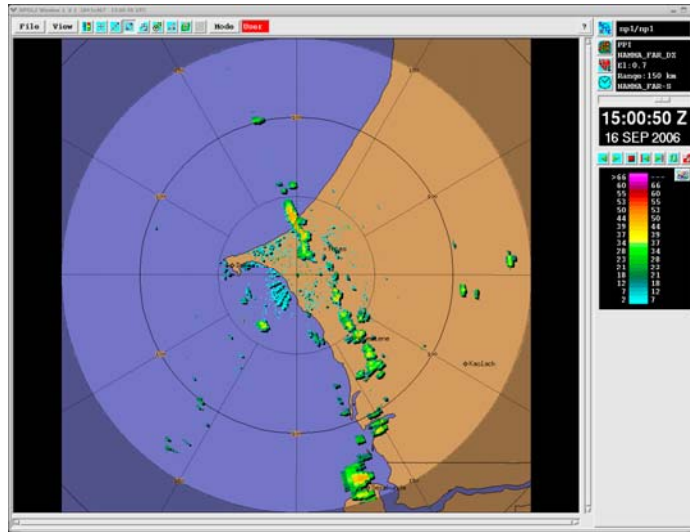
16 September 2006

0650 UTC: Reinitialized Bgan Satellite transceiver. Acquired signal of about 60%. PGB

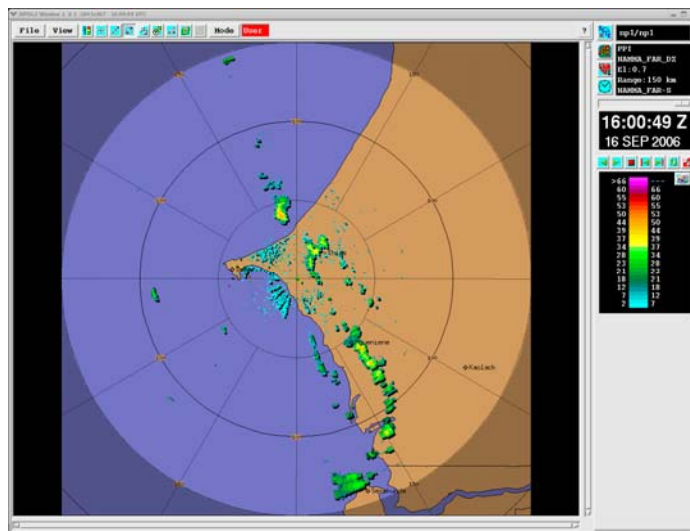
0800 UTC: Day crew relieves the night crew

0900 UTC: Very few cells present.

1500 UTC: Line of cells intensifies but seems to remain stationary.



1600 UTC:



1700 UTC: Dr. Fadel Kebe takes UPS back to his Lab at the University to see if it can be repaired.

2000 UTC: Night shift relieved day shift. There are just some high clouds around NPOL. Nothing is showing up in the NAMMA\_FAR-S scanning area except some AP from the nighttime inversion setting up. There is one lonely shower on the surveillance scan. It is around 190 km SSW of NPOL, moving W. AJN

2200 UTC: The loner show has passed away out over the ocean. Now, all that's left on either scan is the nighttime AP. Looks like it will be a quiet night tonight. AJN

17 September 2006:

0000 UTC: Severe clear tonight, just some light AP and the standard clutter around NPOL. AJN

0200 UTC: Still all clear. Looks to be clear of even clouds at NPOL. AJN

0400 UTC: Severe clear. AJN

0600 UTC: There appears to be one lone weak shower moving NNE. It is located about 35 km from NPOL at a bearing of 217°. AJN

0800 UTC: Day shift relieved night shift. AJN

0830 UTC Ck'd gen temp and fuel level. PLH

1610 UTC Rain started. Several cells developing SE. PLH

2000 UTC: Night shift relieved day shift. Convection to the SE has died with the sunset. It looks like another quiet night. There is one cell around 200 km away, moving SW over the border of The Gambia and southern Senegal. AJN

2200 UTC: Severe clear again tonight around NPOL. There may be a bit of second trip echo around 160° on the surveillance scan, indicating something very far away. AJN

18 September 2006:

0005 UTC: Noticed that NPOL is not transmitting (hasn't since the 2330 scan) and there doesn't seem to be any current getting to the transmitter according to the meters on the transmitter box. Called Michael and he suggested restarting the transmitter. I am trying that now. AJN

0025 UTC: Restarting the transmitter seemed to do the trick. Scheduling scans to restart at 0030 UTC. AJN

0030 UTC: Scans restarted and transmitter did its thing. Will monitor the situation. AJN

0130 UTC: NPOL made it through 3 scans and the problem reoccurred with the 0115 scan. There isn't any weather currently at least. AJN

0145 UTC: Tried to restart transmitter again, but it failed. I am stopping the scans for the remainder of the night shift. AJN

0500 UTC: Lightning is visible to the SSW/SW of NPOL. From the last surveillance scan around 0130 I'm guessing the convection is still over 100 km away and moving NW or NNW. AJN

0700 UTC: Cirrus blow off is over NPOL. It is dark to the SW/SSW. Not sure how close the rain is. AJN

0800 UTC: Day shift relieved night shift. Michael will be arriving shortly to begin diagnosing the situation. An outflow boundary is approaching slowly from the SW. AJN

09:40 UTC: Started diagnosing the transmitter problem. At 950 prf the transmitter would intermittently stop radiating, but the radiate light would remain lit. Discovered that the modulator power supply was shutting down.

What follows are changes made to the system during the troubleshooting process.

The modulator power supply was replaced and the H/V was adjusted to match the 5.64 dBm power meter reading taken during the 19 Aug H single channel calibration to determine the transmitter power.

It was determined that the arcing was occurring in the magnetron. The magnetron was replaced.

The reverse power decreased from 4 dB to 7 dB by adjusting the double stub tuners.

The H and V forward and reverse powers are much more stable.

The modulator voltage has changed from .84 kV to .82 kV.

The modulator current has changed from .52 A to .51 A.

The magnetron current has changed from 44.5 mA to 38.0 mA.

The .8  $\mu$ s pw was observed. I am not sure if it is good or not. I will find out. mw I described the pw to Lester and he advised me that the pw is ok.

A H only zauto was done but not updated. The values are close to the one done on 19 Aug.

23:45 UTC: Have been monitoring the transmitter since the completion, at 07:00 UTC, of the magnetron replacement. Problem appears to be corrected. Restarted scheduled scans.

19 September 2006 (Tue):

04:45 UTC: Same transmitter problem.

05:30 UTC: Reset modulator power supply. Checked generator diesel fuel, 208 gallons left.

07:30 UTC: G. Jenkins called inquiring of any weather activity. He was informed that there is nothing in the area.

0800 UTC: No weather to speak of. Shift change, everything is running well. PAK

0850 UTC: Transmitter dropped out. Reset and started scanning at 0900 UTC. PAK

0910 UTC: Transmitter dropped out. Turned off transmitter this time and also stopped using surveillance scans.

0945 UTC: Scanning again. PAK

1100 UTC: Scattered convection developing to the far NNE of the radar (scattered cells). PAK

1200 UTC: Convection continues to develop to the NE and become more organized in a N-S orientated line. A line of convection is developing along the coast S of NPOL. PAK

1215 UTC: Transmitter dropped out. Reset.

1300 UTC: Convection to the S has moved offshore and dissipated. The convection to the NE continues to maintain and move to the WSW. Maximum reflectivity is about 50 dBZ with echo top heights in the deepest core reaching 15 km. PAK

1500 UTC: Convection continues to move W and is in a loosely organized line from NNW to S of NPOL along the entire range of NPOL (~300 km). Most of the convection is along the coast and will be moving offshore soon. PAK

2000 UTC: Night shift relieved day shift. Some convection to the SE over The Gambia is showing up on the surveillance scan. It is over 200 km away and moving NW. AJN

2200 UTC: Convection has died. A small area of residual stratiform precipitation is now S/SSW of NPOL 145-170 km. AJN

20 September 2006:

0000 UTC: All clear on both scans (Yes NPOL is radiating). I can't see the stars though so it must be cloudy. AJN

0005 UTC Ck'd gen temp and fuel. Will need some more motion lotion soon! Xmitter dropped out at 1920, 1957 and 2110 hrs. PLH

0200 UTC: The all-clear signal is still being given at NPOL. AJN

0313 UTC Xmitter went TU again, reset. PLH

0320 UTC Stopped radiating. Reset. PLH

0400 UTC: No precipitation echo to report and average clutter equals one quiet night weather wise. AJN

0600 UTC: Severe clear. AJN

0800 UTC: Shift change. No weather in the area. Mike is going to work on the radar for a bit so we turned off the scans. PAK

09:00 UTC: Restarted scheduled scans. Was able to adjust the H reverse power .5 dB better and the V reverse power 0.75 dB better.

1045 UTC: Shutting down to service the generator. PAK

1130 UTC: Service complete. Generator looks fine. PAK

1145 UTC: Antenna is not working properly. Trying to diagnose the problem. We reseated the cables and it seems to have helped. PAK

1330 UTC: Starting scanning again. It looks like there is sea breeze convergence over the Dakar Peninsula. PAK

1340 UTC: Still having antenna problems...Shutdown. PAK



1935 UTC: We are still down. We think we have isolated the problem to the RCP02, but not 100%. We have had a few showers pass by, but no significant weather events. PAK

2100 UTC: We couldn't solve the antenna problem. We shutdown generator and locked everything up. PAK

21 September 2006:

1100 UTC: Mike and Paul K. arrived to continue to work on antenna problem. Brought the generator and trailers back up. NPOL2 had a problem coming up...got it going after a couple reboots. Need to watch closely. PAK

1200 UTC: Still working on antenna problems. Satellite shows a vortex developing off the coast, but no convection in the vicinity of the radar PAK

1315 UTC: We have the radar running (knock on wood). It seems that we had a loose connection on the pedestal. We are running surveillance only for a test. PAK

1400 UTC: Initial tests with surveillance went well. We started full volume scan operations...we are turnin' and burnin'. PAK

2000 UTC: Severe clear all day, but radar has been running good. Shift change. Paul B. and Sanghere is on Night crew. PAK

22 September 2006:

Radar has been running without problems until 0210 hours. I noticed it had dropped out of radiating. Reset it without problem. PGB

0620 UTC: No more incidents with the radar cutting out. No significant weather to report. PGB

0930 UTC: Magnetron stopped radiating. Reset. First scan back will be the 1000 UTC scan.

1130 UTC: Squall line approaching from the East. It is located at maximum range (~270 km) from the radar centered at azimuth of 110 deg. PAK

1230 UTC: Squall line continues to move East. It is now located approximately 200 km to the ESE of the radar. It extends from 90 deg to beyond the range of the radar. PAK

1330 UTC: Squall line has reached about 100 km from radar. It still extends to the south of the NPOL with its northern extent located straight east of NPOL. Max reflectivity in the cores is approaching 45 dBZ. PAK

1500 UTC: Outflow passage at NPOL. There is not much convection associated with the line on the northern end. The line is transitioning to the ocean. Most of the convection is to the S. of NPOL and rather weak. PAK

1500 – 1600 UTC: Radar transmitter offline. Reset at 1600 UTC. PAK

1730 UTC: The line has moved off the coast and dissipated. There is very little echo to speak of. We put the diesel fuel from the barrels into the tank as back up. We are supposed to have more fuel tomorrow. PAK

1132 UTC: Transmitter stopped radiating. Reset transmitter and it showed good mod voltage, but mod current and magnetron current were showing zero values, and we saw no ground clutter. I called Lester and he told me to stop radiating, open the door and close it and then push the radiate button. That reset the gauges, and cleared it. PGB

Note added: Transmitter stopped at 23:25 on 22.5 deg tilt scan and was restarted at 23:37 on the 11.3 degree tilt of the next volume scan. JCG

0310 UTC: Transmitter stopped radiating during scan. We had difficulty in locking the front panel back in place with the lock screws. With some effort, we managed to secure the lock screws on the panel and then restarted the transmitter. No significant weather to report. PGB

0800 UTC: Day crew relieves night crew. Weather still suppressed. Expect visits from French Falcon coordinator and fuel delivery today.

0845 UTC: Transmitter dropped out at high elevation tilt. Waited until new scan was scheduled but it did not restart. Pushing "ON" button did not restart it. Opened and closed the cabinet door and pushed the "ON" button which restarted the transmitter but it shutdown again shortly thereafter. Redid the sequence and heard an arc in the high voltage, transmitter started and stopped again. I pushed "ON" button and it restarted. About 4 minutes later stopped again. I pushed "ON" button and it restarted. No weather for TRMM overpass. JCG

1130 UTC: Stopped scans to do maintenance and calibrations. JCG

1300 UTC: Scans started again. Zauto7 in H and V channel were close to previous values so no update was done. Copies were saved to a file. JCG

1310 UTC: Fuel delivery. . No weather targets within range. JCG

1335 UTC: Transmitter shut off again. Lester adjusted interlock switches on the door to the magnetron.

1600 UTC: French Falcon team visit radar. Two vans of people.

1801 UTC: Error scan stopped after 22 sec of unusable data. (EL position not reached) Scans failed on every elevation level after the first for the next two cycles.

1830 UTC: Noticed that the start times were off and realized that there had been a problem. Working at the science log terminal error notices are not seen. Three people working in the science container also failed to notice the errors. Sequence starting at this time seemed to run ok

1900 UTC: Cell forms at the North West coast at 125 km from the radar.

1930 UTC: Stopped the volume scan to get it back on schedule. Run two additional surveillance scans. Cell mentioned above intensifies but scan tops it after a couple of elevation steps. JCG

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0227 UTC: Transmitter dropped out during the last tilt. LNG

1035 UTC: Transmitter went into standby mode during 7° elevation sweep of volume scan. Pressed on button and transmitter started back up without problem. PGB

1355 UTC: Transmitter voltage began to drain down and current dropped after 2 snaps. I opened the door and closed it and the transmitter went into standby mode. I restarted it without trouble. The radar was in the last two scans of the volume scan. PGB

1700 UTC: No weather targets. We did see the sea breeze front and another frontal boundary. Today was the start of Ramadan. There were many people at Kawsara including the religious leader of the village who came down from Tooba (?). Greg, Amadou and the village leaders had an audience with him in the mosque.

1736 UTC: Error – DSP AZ angles exceeded 30 degrees. Followed by 7 errors – Problem starting scan after 22 sec of unusable data (EL angle not reached) I monitored the antenna program and watched the antenna and the antenna seemed to be doing fine. Lester recommended resetting the

RCP02, which has seemed to clear up the problem. The RT Display was frozen while the RCP7 was not taking data.

1946 UTC: Error Waveguide pressure switch. Transmitter kicked off in response. Noticed it was not on a few minutes later, turned on and it restarted without problem.

21:01 UTC: Reset transmitter.

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00:58 UTC: Reset transmitter.

05:49 UTC: Transmitter dropped off, and kept getting the following error messages;

DSP AZ Angles exceed 30 degree span  
Problem starting scan at EL=  
Scan stopped after 22 sec of unusable data.

Lengthened the contact pin on the S8 interlock on transmitter door interlock circuit.

06:40 UTC: Stopped the antenna program, which caused the following errors:

Invalid argument lock\_sem.  
Invalid argument unlock\_sem.  
Invalid argument sig\_setenf.

Restarted IRIS and started scanning again. Reset the dehydrator also, it had faults F8, and F11. This is caused by a bad canister and should be replaced when we get back to WFF as well as TOGA's.

0830 UTC: Shift change. Paul K., Lester, and Samo replaced Nathan, Mike, and Mactar. There was a lot of 2<sup>nd</sup> trip echo on the Surveillance and third trip echo on the volume scan. It looked like there was a MCS (squall line) about 300 km or further away from the radar. PAK

1000 UTC: The convection to the East must have dissipated because the 2<sup>nd</sup> trip has disappeared and no echo (except for a small system to the South) is within radar range. PAK

1130 UTC: Antenna shut down because of antenna problems. Lester worked on connectors to see if it will help. PAK

1200 UTC: Back scanning. A small line of convection has formed to the S, just off the coast of Gambia. PAK

1400 UTC: Radar running good. Not much echo within radar range. PAK

1600 UTC: A few small cells have developed that look to be linked with the sea breeze. Otherwise, not much else going on.

1800 UTC: One isolated system has developed south of use near The Gambia. It is about 50 km in dimensions and has good vertical structure. Maximum reflectivities are > mid 40 dBZ. Nothing else on the display.  
PAK

1730 UTC: The cell to the South has intensified. It looks to be associated with an outflow boundary that has moved its way across Senegal. Convection is forming on the N and S of an apparent boundary. The northern edge is about 30 km of NPOL and the Southern system is located North of the border with Gambia. It looks like the two convective systems have split. We observe frequent lightning with the system to the South.  
PAK

1830 UTC: Convection to the S continues to move West and is along the coast. It appears to be weakening at this time. Shift change...I am outta here. PAK

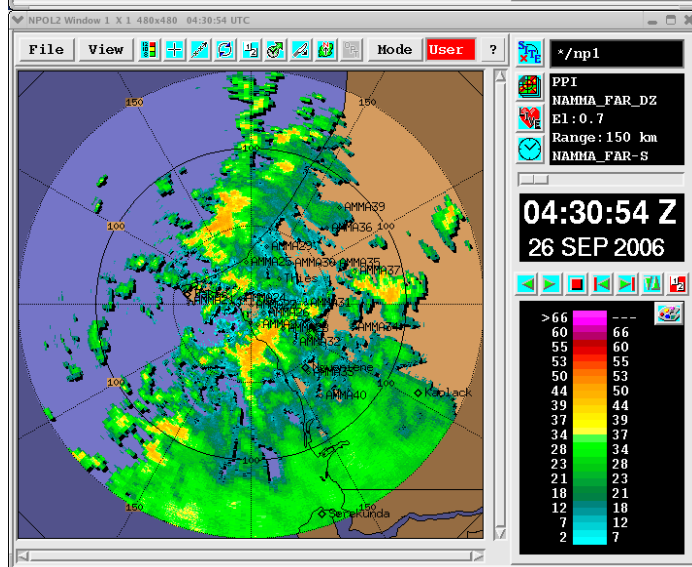
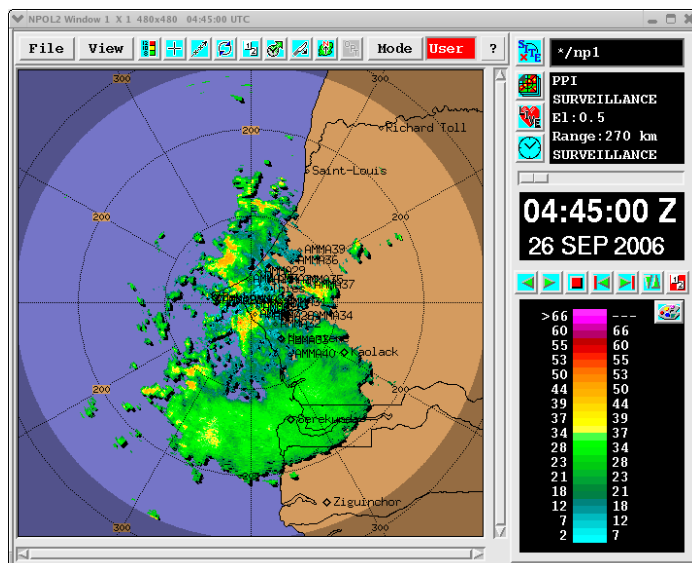
22:02 UTC: Reset transmitter.

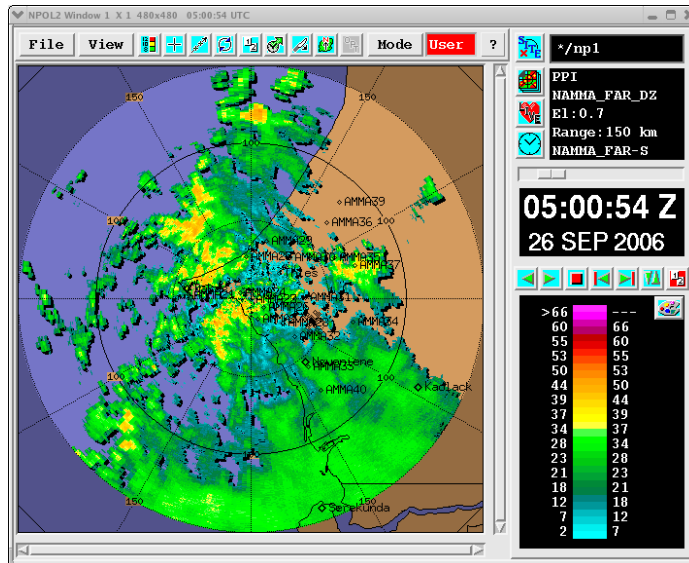
26 September 2006

01:49 UTC: Reset transmitter.

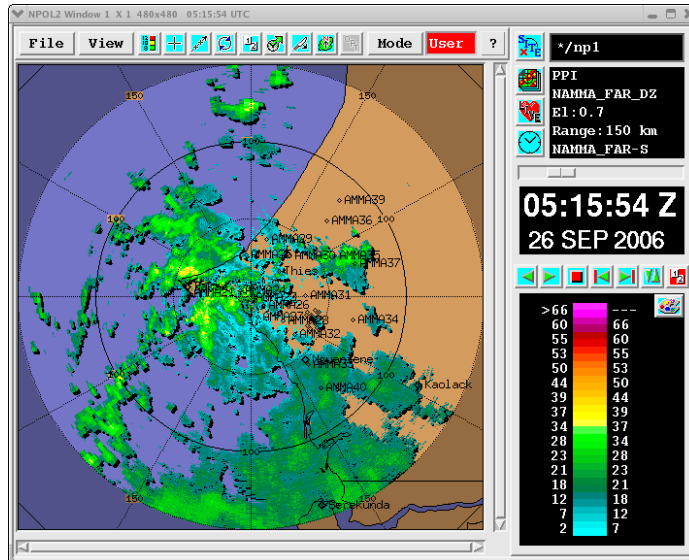
03:46 UTC: Reset transmitter.

0445 UTC: Squall line that formed over the Gambia River has moved North West and is leaving Senegal.

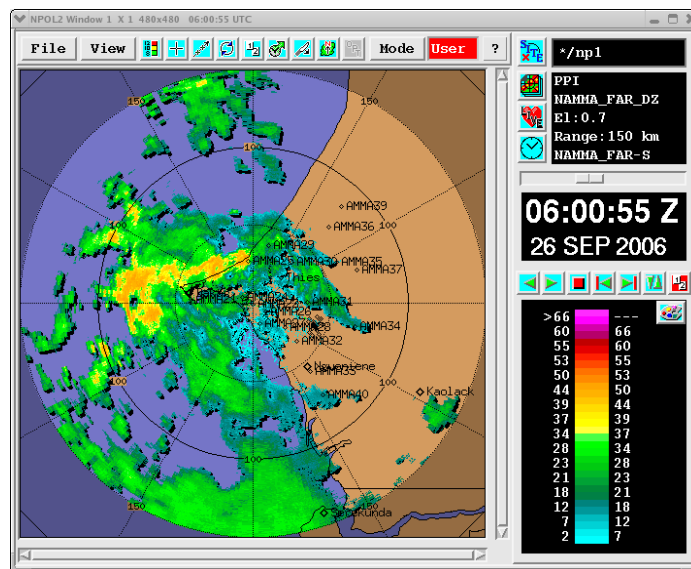
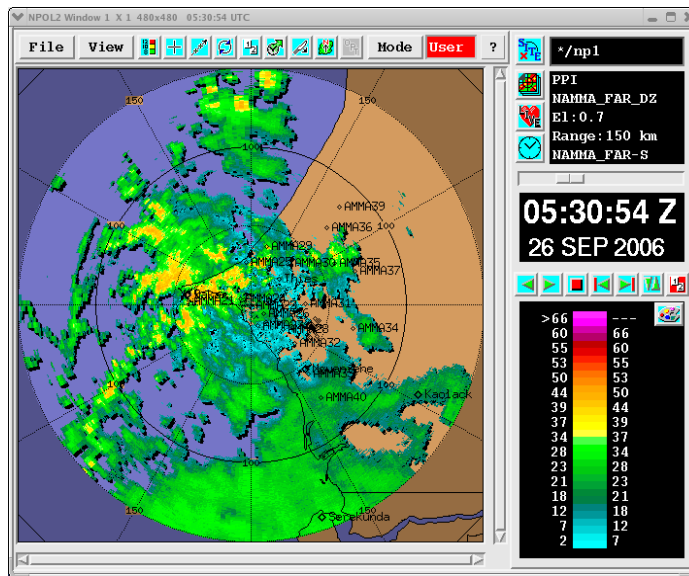




05:15 UTC: Antenna is attenuated due to heavy rain as image below demonstrates.



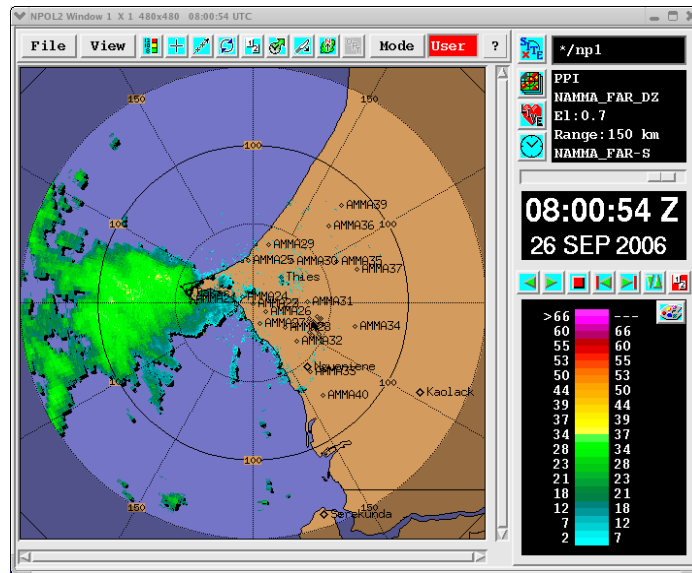
05:30 UTC: Antenna has recovered.



07:44 UTC: Reset transmitter.

0800 UTC: Most of the rain is now off shore





1000 UTC: Started RHI scans at 195, 196 and 197 deg AZ at request of French Falcon. First RHI was done at max range of 227 Km with 2 byte data. Changed later RHI's to data range of 150 Km and back to one byte data. JCG

1100 UTC: Only activity is due south at 225 Km.

1200 UTC: System to the south is growing in size but diminishing in strength. Looping the echoes suggests that it might be a center of circulation. A small line of cells appears to have been spawned on the NE side of the system.

1300 UTC: The line of cells is now 200 Km to the south and moving toward us.

1325 UTC: Antenna Error messages. El Angle greater than 15 degree span with an occasional El TACH check.

1332 UTC: RCP02 shutdown – comes back up. Lester reseats cables on the back of the hand wheel unit and has the antenna back up by 13:46. Scans start again on the hour.

1400 UTC: Line becomes two large thunderstorms cells.

1425 UTC: Line appears to be a squall line and grows as it approaches the Gambia River it is now about 100 Km long and still moving to the north.

1500 UTC: Line crosses the Gambia River and is still growing.

1600 UTC: As line grows it is becoming bow shaped.

1630 UTC: Line breaks into large convective clusters.

1700 UTC: Cells begin to dissipate. There is new development to the north along the coast. Convection triggered by the land sea interface? JCG

1900 UTC: All the activity dies with the setting sun.

21:12 UTC: Transmitter dropped out. Mod voltage stayed up but mod current and mag current went to zero. Opened the door a couple of times to turn back on.

23:44 UTC: Momentary transmitter drop out, and arc down near the power supply. Transmitter came back up by itself.

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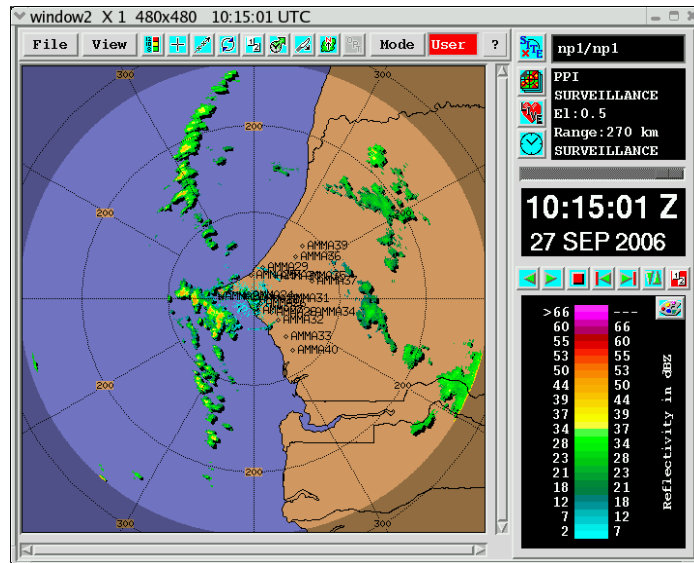
01:44 UTC: Transmitter arced at 26deg angle. Slightly different this time as mod voltage was at .2 and no currents. Tried turning on the transmitter several times to no avail. Opened and shut the door and the transmitter came back up the second time I hit the ON button.

04:35 UTC: Transmitter dropped out several times. Each time there is an arc in the bottom half of the transmitter cabinet.

05:23 UTC: Transmitter dropped out but didn't arc.

0820 UTC: Transmitter dropped off after arcing. Resetting required opening cabinet door to reset HV power supply and then turning transmitter back on. JCG

1015 UTC: Large area of precipitation triggers a squall lines when they reach the ocean. Lines are moving fairly quickly ~ 18 m/s, to the west.



1100 UTC: Cells continue to move away toward the west. The cells over land are dying.

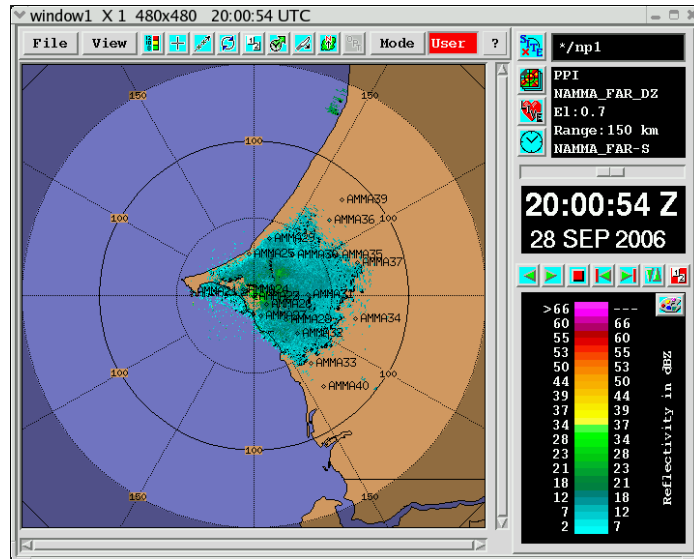
1300 UTC: Almost no echoes over land.

1500 UTC: Greg arrives with BBC free lance reporter/camera man. He interviews PK and films in village. Women and children singing is memorable. JCG

1700 UTC: PK changes DVD's on NPOL2. He can not install another USB archive because of a SIGMET limitation.

1900 UTC: So far no shutdowns since the crew change but no weather this PM. Generator temperature is slightly higher than it has been running it may be an indication of overheating caused by dirt clogging the radiator. (?)

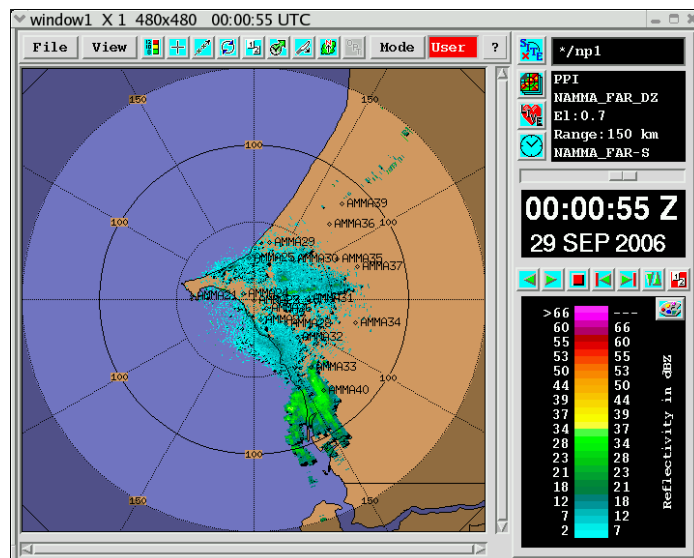
2000 UTC: As the sun sets the insects come up out of the fields.



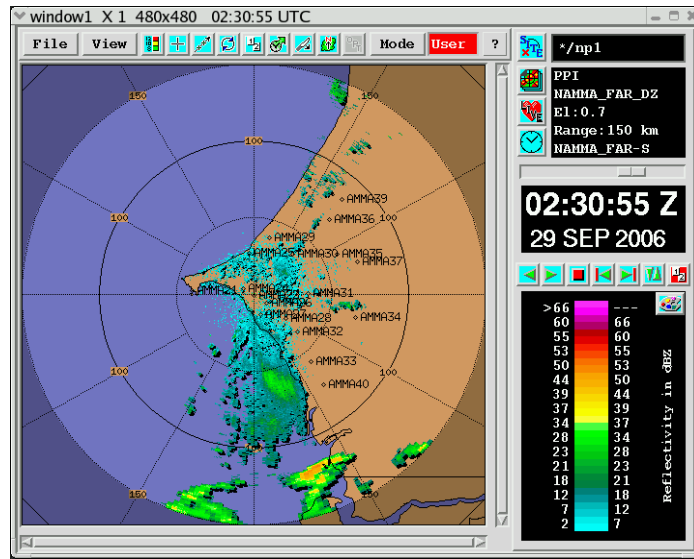
2147 UTC: Transmitter dropped of twice with arcing. First time it recovered and the second time I had to open the door, wait until the high voltage went back to right level and turn the transmitter back on.

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0000 UTC: Rain showers along the coast to the SSE. Insects are the major scattering targets at the lower altitudes.

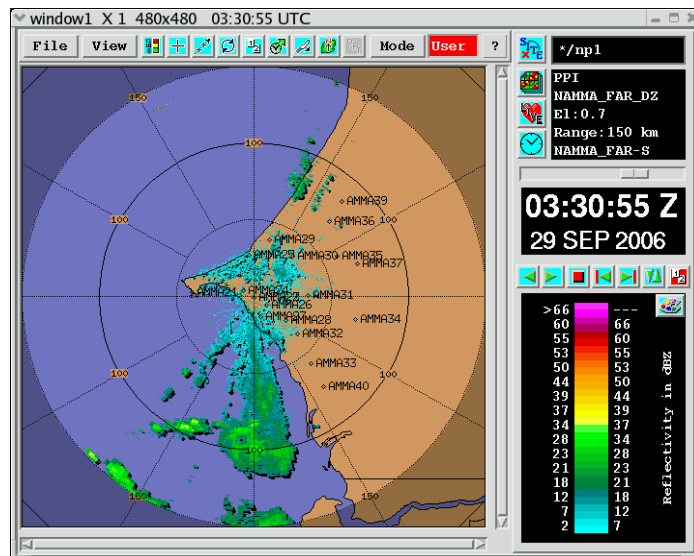


02:08 UTC: Reset dehydrator and transmitter.



03:27 UTC: Reset transmitter.

0330 UTC: Cells dissipating, second trip echoes suggest convection further to the south.



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05:43 UTC: Reset transmitter.

07:11 UTC: Reset transmitter.

0830 UTC: No echoes within 270 Km.

1054 UTC: Dehydrator in rack continues to run instead of cycling. Turned it off and back on to reset. Noticed that transmitter was off. Pushed the ON button to restart. JCG

1645 UTC: A few isolated fairly strong cells are popping up within 100 Km. One is along the western coastline just to the south of us. It maybe trigger by the sea breeze.

1810 UTC: Transmitter mod and mag current went to zero. Did not notice anything was wrong since radiate light was still on. We lost the 1815 scan series. Back on schedule at 1830 UTC. Only isolate thunderstorms to the SE. JCG

2030 UTC: Isolated convection drops as the sun set and insects rise out of the field to migrate. JCG

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0220 UTC: Reset Transmitter

0737 UTC: Reset Transmitter

0800 UTC: Shift change: Paul K, John, and Paul B. relieved Chuck and Nathan. No weather, severe clear is being observed. We plan to shut down at 1200 UTC unless significant weather develops. PAK

1200 UTC: Operations terminated. JCG Addendum: No weather when we stopped scanning. We collected over 30 GB of data from NPOL and over 70 GB of data for both radars. A very successful project! PAK